Science

PACIFIC DISCOVERY

Exploration
Nature
Geography
History
Man

FIFTY CENTS

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OUR EYES ON THE UNIVERSE:
REFLECTING TELESCOPES

MAY–JUNE 1960
VOLUME XIII · NUMBER 3

PACIFIC DISCOVERY

PRE-DISCOVERY

A FAVORITE THEME OF *Pacific Discovery* is man's relation to his natural environment. It would be well from time to time to give some thought to man's relation to his unnatural environment, meaning by that the physical surroundings man has long created for himself in his cities and, overwhelmingly of late, in some gigantic metropolitan complexes. Every city ever built has contained a measure of ugliness and misery, while at the same time providing its more favored inmates with physical comfort, security, and the social climate historically required for the flowering of culture. Cities are necessary and not altogether evil. They are certainly here to stay. For more and more of the world's population, these concretions of interdependent artificial shelter, economic facilities, and cultural amenities have become in actual fact the natural environment, the farther from non-human nature the more human.

There is still, nevertheless—and we are glad of it—something in human nature that cries: this far and no farther—to the process of confining man in urban cellblocks and shutting him utterly away from Nature. This cry is swelling with numbers. It could become a cry in the wilderness of concrete and steel, and die to a death-moan. Or it could become a manly battlecry to challenge the inexorability of the unhuman and the inhuman. Happily there is much evidence for the vigor of protest, and its ultimate effectiveness. We see this in the trend toward urban planning, which at its best works in two directions. There is the planning for urban redevelopment—the housecleaning, slum clearing, space opening, traffic decongesting (we may even include smog abatement)—and all such efforts to make our confinement bearable if not unqualifiedly pleasurable. And there are the reëvaluation and reconsideration of the modes and trends of outward growth—urban sprawl.

California's metropolitan communities of greater Los Angeles and the San Francisco Bay Area, bursting like status seekers toward megalopolis, are cases in point. With Planning more and more in the wind, their citizens must inform themselves—learn what the shouting is about—in order to act intelligently when a community scheme or project is put to the vote. A good place to start is with what is there and how it got that way. San Francisco Bay people are fortunate in having at hand an excellent, highly readable, and generously illustrated historical study of their region: Mel Scott's *The San Francisco Bay Area: A Metropolis in Perspective* (University of California Press, Berkeley and Los Angeles. 1959. xi + 333 pp., $12.50). A Lecturer in City Planning at the University of California, Mr. Scott has put forth a noteworthy example of analysis of the past, evaluation of the present, and guide to the future which every major city should have at hand as the future rushes in. It is especially gratifying to us that Mr. Scott concludes his monumental study with a vigorous plea for the saving of nearby recreation areas wherever possible. The San Francisco Bay Area has several such opportunities. It must act now or lose them forever.

PD'S AUTHORS

THE EDITORIAL INITIAL on page 1 identifies **Dr. Robert C. Miller,** Director of the California Academy of Sciences and a man who really does love robins. . . . ¶**Dr. Victor B. Scheffer** is a research biologist with the U.S. Fish and Wildlife Service at the laboratory in Seattle. . . . ¶Assistant Professor of Geology at the University of California, Santa Barbara, **Dr. Robert M. Norris** first visited San Nicolas Island while in the Navy during World War II, and later with the USGS. . . . ¶**Benjamin Draper** is executive Producer of the Academy TV program "Science in Action.". . . ¶**Richard H. Dillon** heads the State of California's Sutro Library in San Francisco, is author of the best-selling *Embarcadero*. . . . ¶**Dr. Arthur C. Smith** teaches science teachers at Alameda State College, Hayward. . . . ¶Preparator of Exhibits at the Academy, **Mearl F. Carson** also lectures at the Morrison Planetarium. D.G.K.

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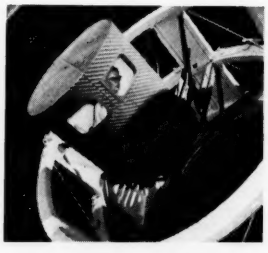
THE COVER



A NEW "GIANT EYE" is on the sky from the summit of Mt. Hamilton. The observer's cage of the new 120-inch reflector, a Lick Observatory photo. *(See pages 24–29.)*

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A JOURNAL OF NATURE AND MAN IN THE PACIFIC WORLD

EDITORIAL

WATERING THE GARDEN

WHEN APRIL SHOWERS have in due course and according to tradition been succeeded by the flowers of May, and the long warm days and the lengthening twilight give notice of the approach of the summer solstice, the amateur gardener begins to hear a gentle, insistent voice that tells him it is time to begin watering the garden. Most commonly this voice, when traced to its source, turns out to be his wife's.

To those who like to water a garden there is no more happily recurring delight, and to those who do not like to water a garden there is no more dull and repetitious chore. To the latter group we recommend removal of habitation to the west side of the Olympic Peninsula where the annual rainfall is 135 inches, or to the island of Kauai where, on the wet side—that is not a misprint, nor is the following—the annual rainfall approximates 39 feet. Nature will take care of the watering problem if you select the right spot.

But to those who prefer to remain where they are, and to assist Nature from time to time as necessary—Nature with its largely unpredictable cycles of gentle rain and flood and drouth — we address these few remarks.

Ideally, watering the garden is the most enjoyable pursuit of the gardener. Of course, in this as in most other human activities, the ideal is more frequently approached than actually achieved. Our studies show that in 30 per cent of all cases a leak will develop where the nozzle is screwed onto the hose, permitting the escape of a small stream of water which will either squirt up the operator's sleeve, or drip on his shoes, or both. And there are other hazards.

A neighbor of ours was one day blissfully watering his garden and mightily admiring the harmony of Nature when he discovered that he was standing on an anthill. At the time he made this discovery, the ants were not in his plants. It was in vain that we assured him that the ants had mistaken him for an oversized vegetable, and were merely trying to transplant some aphids onto him. He appeared distraught, and seemed wholly unable to recapture his earlier mood of euphoria.

Two weeks ago last Saturday—we remember it as if it were yesterday—we were settling down to a pleasant day of gardening, in a chair on the patio, with two seed catalogues and Bailey's *Standard Cyclopedia of Horticulture,* when again we heard that still, small voice. This time it said, "Have you noticed those brown spots on the lawn? Do you suppose we have lawn moths?"

Now any gardener's instinct — that delicate sixth sense which the uninformed sometimes confuse with laziness—will tell him that, as between treating the lawn with chlordane and sprinkling it with water, water is by all means to be tried first. In a trice (a period of time a little shorter than an hour) we were out there with sleeves rolled up, tightening the nozzle on the hose and hoping for the best.

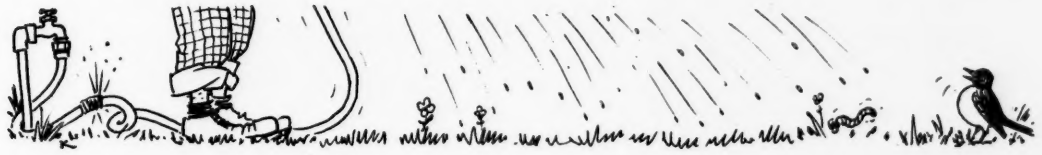
There may be some carping critics who maintain that keeping a lawn is not gardening. Well, what is it? It is not farming, not fruit growing, not arboriculture. Maybe, considering lawn moths, ants, wireworms, moles and gophers, keeping a lawn is a form of animal husbandry.

These dark mutterings presently subsided under the spell of warm spring sunshine, and soon we found ourselves positively enjoying standing there playing the hose on the somewhat greenish grass. Shortly a robin arrived and, announcing himself with a few strident beeps and subdued chirrups, cocked an eye expectantly for the first earthworm to come up in response to our artificial rain. He stood erect with chest out in a manner to make us slightly embarrassed over our own indifferent posture. Why is it that when a robin sticks out in front, it looks like his chest instead of his stomach?

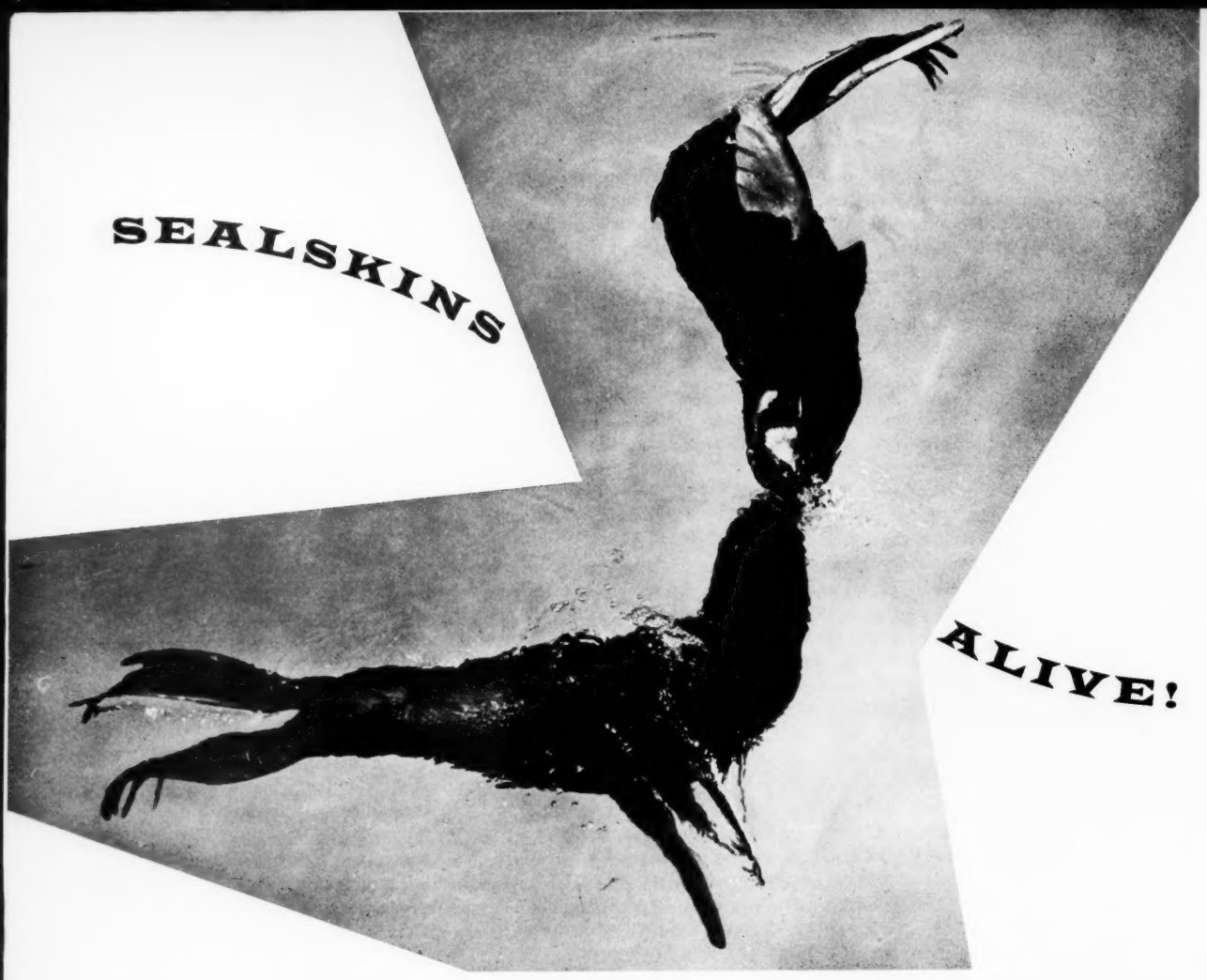
This slightly rueful line of thought was interrupted by the arrival of a hummingbird, a winged gem that darted through our spray, then turned and darted through again. It must be a delight to fly under one's own power—up, down, forward, even backward as the hummingbird can. It *is* a delight to take a shower. How perfectly wonderful it must be to do both of these things at once! As if in answer to this thought, the hummingbird darted through the spray once more, its iridescent hues mingling with the colors of the rainbow in the water-droplets.

Suddenly we felt at peace with the world. A benediction of contentment descended upon us. Truly, we thought—as we played St. Francis to the birds—watering gives the gardener his finest hour. He can appear to be busy without actually doing any work. He has found the pot of gold at the end of the rainbow—his own private rainbow. Is there a chore to be done? Should he be polishing the car? Should he be cleaning the basement? Hah! He can't — he's watering the garden.

R.C.M.



SEALSKINS ALIVE!



THE OCEAN, as a dwelling place for warm-blooded creatures, is a forbidding province. Few mammals have been able to exploit it. Only the Cetacea (whales and dolphins) have in fact become truly marine. Still attached to the coastline or to floating ice are the Sirenia (dugongs and manatees), the Pinnipedia (seals and walruses), and one of the Carnivora: the sea otter.

Perhaps the greatest barrier raised by the sea to invasion of mammals is its chilly temperature. Those species which have successfully broken through the barrier are now able to maintain a deep-body heat close to that of man (98.6° F.), in spite of surroundings which may be colder than body heat by anywhere from 20° to 67°. All marine mammals with the exception of the sea otter have met the challenge of cold by developing blubber, a thick white vest of insulating fat beneath the skin. Zoölogist Ian McLaren has found that the body of the ringed seal in winter contains no less than 44 per cent blubber! The sea otter—in many ways a strange and unlikely product of evolution—keeps warm with the help of minute air pockets trapped in its velvety fur. It also eats a great deal of food for an animal of its size, and thereby maintains a high daily intake of calories.

With respect to body covering, the seals and walruses represent a compromise. Committed to an amphibious life, they have not been able to choose, as it were, between a swimming suit and a lounging suit. While the whales have lost contact with land and have developed a naked, rubbery skin, all pinnipeds return to land or ice for breeding purposes, and most of them wear a hairy coat as protection for the body against abrasion.

As the pinniped is one of Nature's experiments representing invasion of the sea by a land animal, so within the pinniped group itself we find a variety of experimental body coverings. All pinnipeds, regardless of species, are born with a well defined hairy or woolly coat not unlike that of a land carnivore—say a dog, cat, or weasel. In adult pinnipeds, however, the

How nature combines beauty (to you) and utility (to the fur seal) in one of the world's most

pelage may be almost lacking, or thin, or dense and woolly, or furry. Some zoölogists feel that the pinniped pelage is a relic of Eocene time, when the proto-pinnipeds lived on land. They feel, furthermore, that the hairy coat has little "survival value" today and is on its way out.

The skin of the adult female *walrus* is covered with coarse bristles; that of the male is almost naked. His skin, like that of all pinnipeds, is rich in blood vessels (highly vascular). When he is resting, warm and dry, on rocks in the sun the blood shows through his translucent epidermis and gives a remarkable pinkish effect.

The so-called *hair seals* or earless seals are widely distributed, abundant, and varied in appearance. Classified in thirteen genera, they make up a world population estimated at eleven to twenty-two million. Most of them live in icy polar seas. Among the hair seals are found the only spotted and striped pinnipeds, and the only ones that live in freshwater lakes, such as Lake Baikal. The pelage of the hair seals is rather short and stubbly. On the adult male elephant seal, largest of all pinnipeds, the skin is naked, warty, and wrinkled. A large bull elephant seal may reach a length of twenty-one feet and a weight of four tons!

Sea lions of the world number one or two million and are classified in four genera. They breed in both northern and southern hemispheres. They have a pelage that is familiar to all of you who have watched the trained seals of the zoo, or the seals below Cliff House at San Francisco. The hair is short and brown, as in the coat of a short-haired pony.

The world population of *fur seals* is estimated at two or three million. Fur seals are classified in two groups, a northern genus *Callorhinus* and a southern genus *Arctocephalus,* whose ranges overlap off southern California. Fur seals have a coat with two distinct layers known, respectively, as guard hair and underfur.

So far as known, seals of all species experience a yearly molt in which their dingy faded hairs are replaced by bright new ones. On land, the fox, mink, dog, cat, and all other distant relatives of the seals go through a similar molt (some through two a year). When the elephant seals and monk seals are in the process of shedding, great tatters of outer skin the size of a man's hand peel off along with the old hairs and hang from the body in unlovely shreds.

With these remarks to serve as background information on the outer coats—furry or otherwise—of marine mammals, let us take a closer look at one example, a species which has the most elaborate pelage of all: the northern fur seal. Let us look at the results of a current inquiry into the nature of fur seal fur. In our present study, the skills of many zoölogists have been called into service. Among these are Ford Wilke, chief of fur seal investigations; Carl A. Abegglen, in charge of studies on the Pribilof Islands; Karl Niggol, studies of seals in winter on the North Pacific; George F. Odland, M.D., dermatologist; and Edward Johnson, superintendent of the Seattle Zoo.

In the Zoo, we have sheared small patches of fur from seals and have carefully watched its regrowth on the body. The results jibe with those obtained by

← Fur seals, *Callorhinus,* in the Seattle Zoo. (Harvey Davis)

Northern fur seal, a few days old; Northeast Point, St. Paul Island, Alaska, midsummer. Note typical white spot in armpit. (Photographs by the author)

rld's most prized furs

→ Portrait of a yearling female fur seal—weight, 26 pounds.

A whitish blubber layer lies beneath the skin of a fur seal. Blubber is characteristic of all pinnipeds.

sampling bits of skin taken from dead seals at various seasons.

The midsummer population of northern fur seals is estimated at 1,978,000. Of this number 1,800,000—or 91 per cent—originate on the Pribilof Islands of Alaska. The remainder come from Soviet islands: the Commanders, northern Kuriles, and tiny Robben Island off Sakhalin. The Pribilof herd is capable of yielding 60,000 to 100,000 sealskins per year, with a gross value of over $5 million. The value rises and falls for two main reasons, only the first of which is sensible: (1) biological yield and (2) women's fashions.

The unborn young of the fur seal is, at an early stage, naked and blind, though certain hairs have started to erupt when the fetus is less than one two-hundredths of its ultimate newborn weight. These hairs are the whiskers, or vibrissae, destined to become important sensory organs in the adult. In all pinnipeds the whiskers are highly developed. We have seen one completely blind hair seal and have heard of several others, quite able to gather food though dependent on feel and hearing alone. James Thurber and Rea Irvin, examining a cartoon, clashed over "the way a seal's whiskers go." As a matter of fact, they go both ways; backward at rest and forward in moments of excitement, especially during courtship. The whiskers on the fur seal continue to grow throughout life to a length of 13 inches, whereas the body hairs are shed annually. Karl W. Kenyon measured the longest whisker on a yearling seal in Seattle Zoo and found that it grew 36.5 millimeters (1.44 inches) between February and July, at the rate of 0.20 millimeters a day. At about 5 per cent newborn weight, the body hairs proper begin to sprout on the head and cheeks.

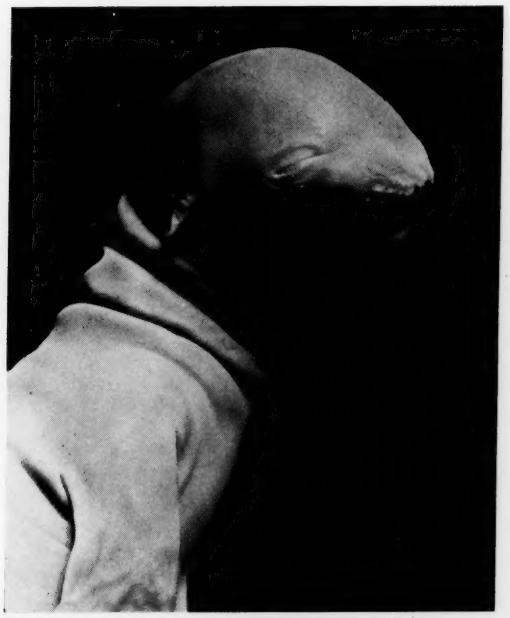
Along toward mid-July the large, alert, precocious pup is born on the Pribilof Islands in a jet black birth-coat whose fibers are fully mature. The pelage of the

Bob Booth has scraped the blubber layer from a fresh sealskin.

The black birthcoat of a full-term pup delivered by Caesarian section—7 pounds, 21 inches.

pup resembles that of a black fox terrier in having small, scattered bundles, each containing one to three fibers. Some of the fibers are delicate underhairs and some are coarse overhairs. The oil glands which lubricate or dress the birthcoat fibers are active, though sweat glands are undeveloped. The pup suckles for three or four months, during which time it sheds the birthcoat and takes on a handsome, silvery, adult-like pelage. This first molt occurs around mid-September. The silver coat represents a distinct break from the puppy coat and here, for the first time, we see the unique fascicles of slender, silky fibers which make up the underfur of the fur seal and give it its reputation in the world of fashion.

In early winter the pup swims away from the nursery. It migrates far out to sea, perhaps to waters off Japan or even off southern California. It molts again in its second autumn, whereupon it may, or may not, return to its native soil. By the September following its second birthday it has started on a rhythmic course which it may follow for twenty or thirty years: winter and spring at sea; summer and fall, with molt, on land. (In Africa, the southern fur seal lingers on the nursery during its first winter and grows to a weight of 50 or 60 pounds, about twice the size of its Alaskan counterpart. Commercial sealing operations may end the life of the southern seal at this point whereas, in Alaska, the commercial kill is taken from older animals, three and four years of age.)



An early, 10-inch fetus on which the whiskers, but not the body hairs, have erupted.

The color patterns of the male and female seal up to age two or three years are indistinguishable. As the male matures, his mane becomes long and gray, while the hairs on top of his head stand erect. He is now known in the language of the fur trader as a "wig." In both sexes at adolescence, three to five years of age, the whiskers begin to turn white at the base. (In the human family, it is the hair of the adolescent's parent that turns white!) The facial appearance of the seal is a useful guide to the Pribilof native workmen who select the seals to be harvested. The selection must be made quickly, in the midst of an excited mob of seals of all ages and both sexes, in the dim light of a Bering Sea morning.

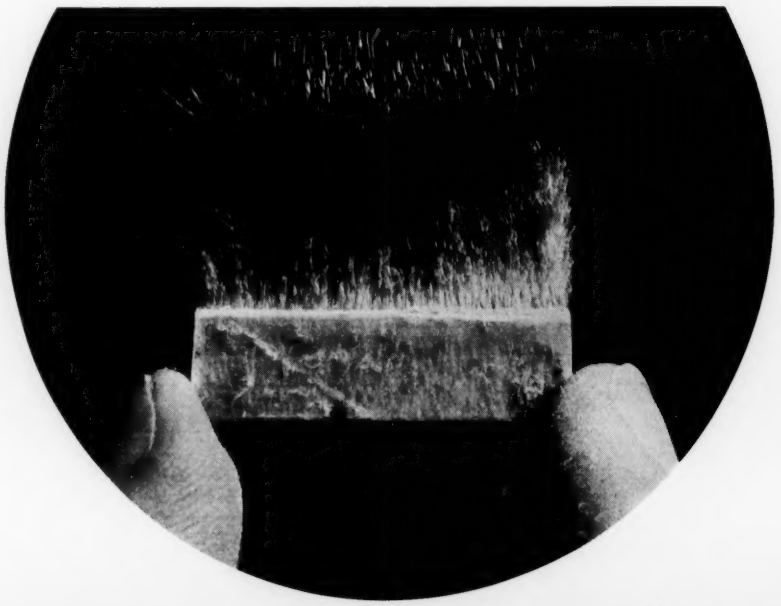
The color patterns of seals from Asia and America seem also to be alike. We wish it weren't so. Government zoölogists would like to discover identifying (diagnostic) marks which would serve to indicate the

➔ **Silhouette of a bit cut from the pelt of an adult male in the region of the mane. Very long hairs rise above ordinary guard hairs and fine underfur hairs. (Enlarged × 2)**

A drop of water, magnified, rests on the underfur of a fresh strip of sealskin. Even at sea, water does not penetrate to the skin. (Enlarged × 6)

national origin of a particular seal. Given such a clue, zoölogists would be able to estimate more easily the percentage of intermingling of seals in winter on international waters. At present, researchers are put to the task of marking individually with metal tags about 50,000 seal pups a year. Facts and figures now on record from the recovery of seals tagged in earlier years are proving to be useful in drafting international agreements for the conservation of seals.

Under the microscope, the pelage of the fur seal appears to be a series of glistening bundles arranged more or less in rows. Each bundle has a long, sword-shaped guard hair at its leading edge, and 35-40 silky fur hairs clustered behind it. There are over 300,000 hairs and fur fibers per square inch. In the processing of a genuine "U. S. Government Alaska Sealskin" the guard hairs are plucked out completely, thus exposing the soft, rippling layer of underfur. In practice, the pelts are placed briefly in a hot room. Steamy heat strikes through from the reverse side of the pelt and loosens the deeply-rooted guard hairs while leaving the fur bundles securely in place.



Strip of dried sealskin showing dense layer of pale, curly underfur through which the coarse guard hairs rise. (Enlarged × 2)

hair-erecting muscles, the muscles that create "goose pimples" in man and that raise the hackles of an angry dog or cat. Seals are able, however, to fluff up the pelage and shake off surface water by vigorous movements of the body. The neck, especially, is extremely muscular and flexible—almost snake-like. Often, when a bull seal in a driving rainstorm shakes himself, he is surrounded for an instant by a shimmering, fog-like halo of droplets.

Deep in the skin at the base of the hair-roots we find an elaborate pattern of sweat glands. Each is a thin-walled, coiled tubule which pours its secretion to the surface of the skin beside the guard hair shaft. "Why," you may ask, "does a fur seal need to sweat?" —a good question. It is hard to understand how sweat can have a cooling effect on an animal enveloped in a thick jacket of fur. As a matter of fact, seals show obvious discomfort in sunny weather. They drool with pink mouth agape, shed copious tears, and wave the hind flippers as cooling vanes. Perhaps the sweat glands do lower the body temperature somewhat; perhaps they eliminate excess salt from seawater ingested with food; perhaps they give the recognition odor of the individual (the odor of the old males is quite rich and musky). Much remains to be learned.

In its fine structure the guard hair consists of a

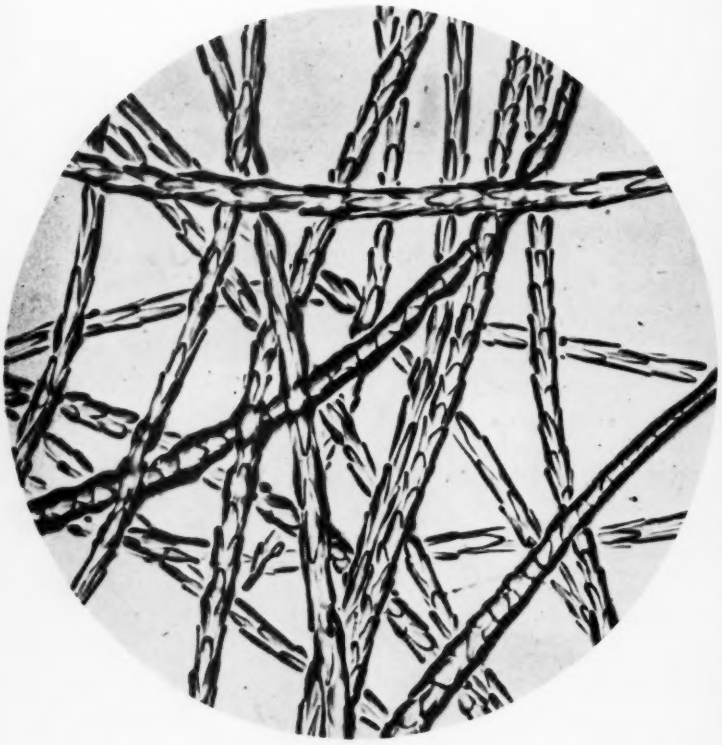
➔ Horizontal section of a prime sealskin with pelage bundles. Beside each whitish guard hair stump is a cluster of about 40 fur fiber stumps, the whole bundle surrounded by a dense fibrous sheath. (Enlarged × 200)

The hairs on the body of the fur seal, as on all other pinnipeds, are slanted strongly backward and downward, giving a sleek, streamlined effect which is advantageous to the seal in swimming. (In sporting-goods stores you may find strips of hair-seal skin designed to be strapped, hairs pointing backward, beneath skis. Thus equipped the skier is able to climb slippery slopes.) The flattened, oily guard hairs of the fur seal act to a certain extent like shingles on a roof, protecting the underfur from water and from rookery filth. In addition, the fur fibers are oily and tightly packed, and are covered with fine scales whose tips curl outward. All of these features protect the true skin and actually keep it warm and dry even though, to all appearances, the seal is sopping wet.

In the skin of the fur seal we have found no

Wet pelage of a molting pup acquiring his first adult-like pelage. As he prepares for sea duty it gradually becomes water repellent. (Enlarged × 3)

long shaft and a swollen root. In the root all growth starts and here brown pigment granules are fed into the shaft. At the start of molt in autumn, pigment is massed in the root of each hair, where it gives a grayish, peppered cast to the reverse side of the pelt. A pelt in this condition is said to be "unprime." Later, the pigment is carried upward with the growing hair. Lastly, the pigment-manufacturing cells in the root come to rest and growth of the shaft, now colorless, slows to a halt. The reverse side of the pelt now has a clear, creamy-white appearance.



Thin-gelatin cast of fur fibers plucked from a sealskin. The free edges of the cuticular scales point upward. On one fiber the slender base shows that the fiber is mature. (Enlarged × 200)

As compared with the guard hair, the individual fur hair is more delicate. In least diameter it measures only three microns. (A micron is .001 millimeter, a millimeter .04 inch.) The fur fiber is strap-shaped, wavy, supple, without central pith, and pale cinnamon brown. It is covered with thin scales arranged in a diamond-petal design. The design can best be seen, not on the fiber itself but on a cast made in thin gelatin or thermoplastic film.

Family of three: adult male, left, with female and her newborn pup. An outsider is in the distance, right, and part of the herd is in the background.

An albino pup in autumn. His normal classmates wear at this season a silvery gray coat.

Color freaks—seals born with a faulty set of genes—are occasionally seen on the Pribilof Islands. About one pup in 70,000 born is a pure albino with snowy hair and fur, and pink eyes and flippers. The white effect is the result of light reflected from a string of minute gas bubbles in the pith of each hair. Pure albinos seldom live to adulthood, perhaps because their eyes are extremely sensitive, or perhaps because they become conspicuous targets for shark and killer whale.

Other freaks are piebald, or a diluted brown known as "chocolate" mutation. Still others have freakness thrust upon them. For one reason or another, brown seaweeds (*Ectocarpus*), red seaweeds (*Erythrocladia*), and gooseneck barnacles (*Lepas*) may attach to the pelage and give it an odd color and texture. Especially is this true of seals during winter in the temperate waters of southern California (where, incidentally, odd jackets on the human form tend to pass unnoticed).

With these few words and pictures we have tried to give you a glimpse of the living fur seal coat, a restless, beautifully complicated, marvelously adapted layer of tissue which separates the animal from its land-and-sea environment. Take a long look, please, the next time you visit the seal pool in your hometown zoo, or stroke the rippling, luxurious surface of a sealskin coat.

Further reading

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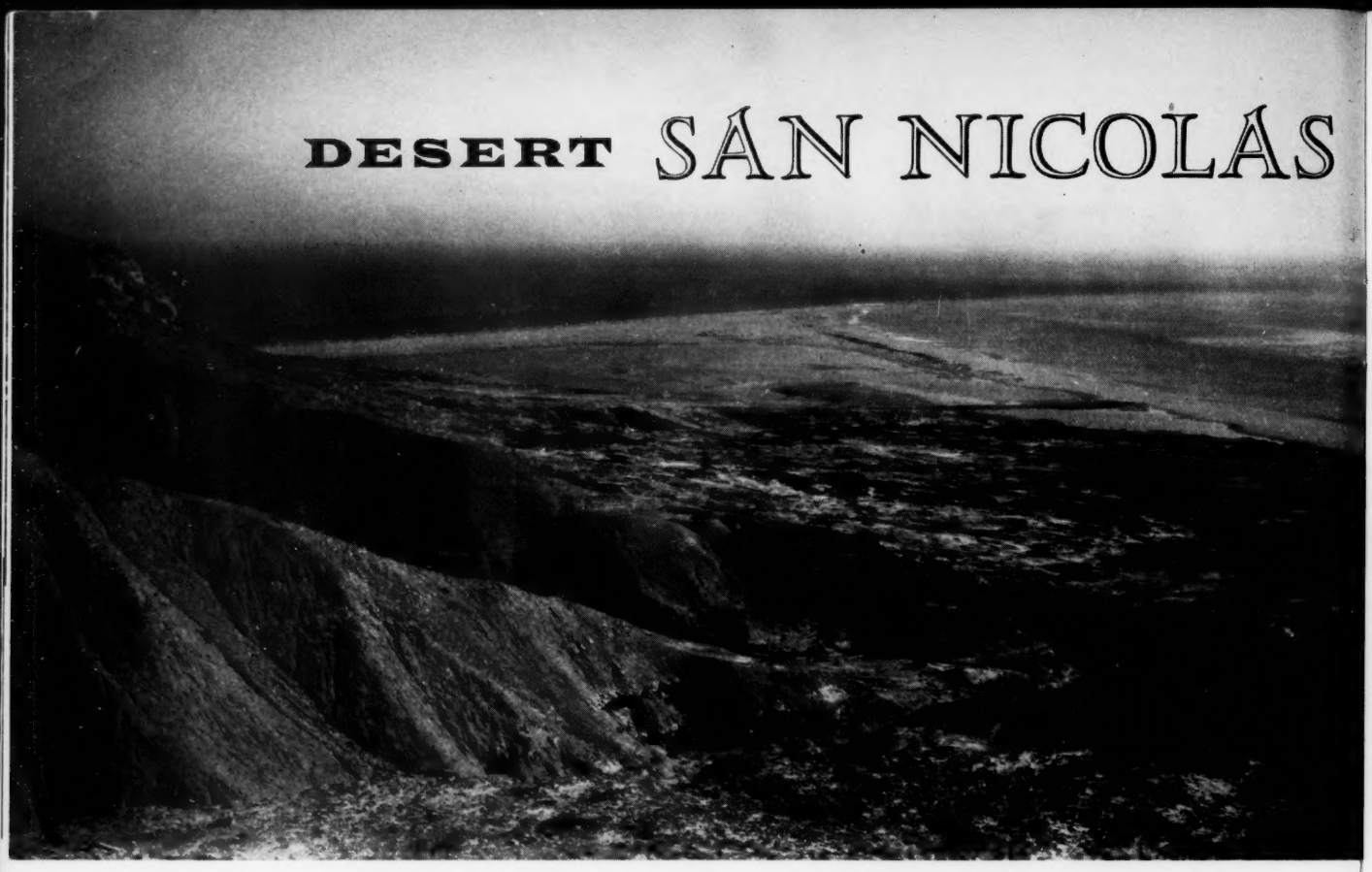
1957 Harem master supreme. *Pacific Discovery*, vol. x, no. 5, pp. 24–28.

A piebald or part albino seal, three or four years old.

Fur seal females in midsummer pelage, with two adult males in the background and a number of black pups scattered about.

DESERT SAN NICOLAS



The large sandspit at the southeast end of San Nicolas, where Captain Nidever and Charles Brown landed in 1853.

ROBERT M. NORRIS

The wind blows away the sand covering San Nicolas' ancient cemetery, and now and then a robust Nicoleño skull is revealed. (Courtesy Clement W. Meighan; see his "The Nicoleño," *Pacific Discovery*, January-February 1954)

SIXTY MILES south of Port Hueneme lies San Nicolas, a barren, flat-topped island of about twenty square miles. Of all the southern California islands, San Nicolas is the most distant from shore. Politically, it is a part of Ventura County, although the county authorities there, like most other southern Californians, are seldom concerned with it.

An unknown visitor to the island shortly before the turn of the century was much impressed with the wind-swept desolation he saw there; the island seemed to him to be blowing into the sea. This traveler referred to San Nicolas as the "Passing Island," an appropriate name in many respects. The past century has seen the disappearance of the last of the Channel Island Indians—the famous Lost Woman of San Nicolas—and even the dogs that lived with the Indians. Now, there are only one or two survivors of the thousands of sheep that were grazed on the island after 1860. As if this weren't enough, the persistent winds and occasional rains are carrying the island itself into the sea, particle by particle.

Although the island was named by Sebastián Viscaíno in 1602, the first white man to see it was prob-

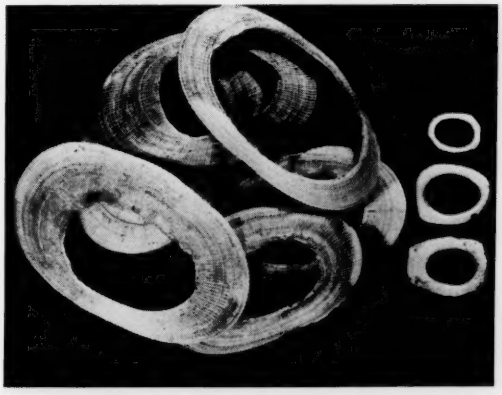
AND THE LAST NICOLEÑO

Eighteen years alone on California's desert island, an Indian woman outdid Robinson Crusoe

ably Ferrelo, Cabrillo's pilot, who left Santa Cruz Island one February day in 1543 in a small launch to search for other islands reported off the inner group. Doubtless, many travelers during the 17th and 18th centuries passed close by San Nicolas, but few of these took the trouble to land and fewer still bothered to comment on it in their journals. The lack of even a fair anchorage and the forbidding, barren appearance of the island probably caused many of these early travelers to seek other more favored landfalls. By the early part of the 19th century, when many trading ships were operating illegally in Californian waters, San Nicolas had more frequent visitors because of the relative safety afforded by its isolation. Many of these traders and hunters found it advisable to elude the Spanish authorities by spending some of their time at the outer islands. One of these men, a Captain Whettemore, who was in the sea otter trade, visited San Nicolas in 1811. He landed his otter hunters, a group of thirty well-armed Aleutian Indians from Sitka. The Captain had business in Baja California which did not require his crew of otter hunters and he therefore sailed without them, returning a few months later. During his absence the Aleuts got into a dispute with the islanders, probably about the women, and systematically butchered all the poorly armed island men and boys, or so the story goes.

Word of the massacre eventually reached the Mission padres at Santa Barbara who arranged with Captain Sparks of that city to set out with his little schooner, the *Peor es Nada* ("Better than Nothing"), to bring back the remaining women. Captain Sparks sailed in 1835, twenty-four years after the Aleuts had done their terrible work. When the *Peor es Nada* reached San Nicolas, seven or eight women were taken aboard—some accounts say as many as twenty. One of the women either hung back when the rest went aboard, or later jumped over the side and swam ashore, supposedly protesting that she had forgotten her child; it is not clear what actually happened. In any event, she alone remained on the island, for faced with a developing storm Captain Sparks feared to wait in San Nicolas' dangerous anchorage and set sail, intending to return for the Indian woman later on. The islanders were landed at Santa Barbara and later taken to San Pedro. A short time after his return to Santa Barbara, Captain Sparks sailed for San Francisco in the *Peor es Nada* and was lost at sea. During the following years, the islanders, who were eventually taken to Mission San Gabriel, all died, and the last survivor of their race, still on the island, was probably forgotten by nearly everyone but the padres at Mission Santa Barbara. They remained hopeful that one day the Lone Woman might be found because they continued to receive occasional reports from visitors to the island who claimed to have seen a woman's footprints on the beach sands. Finally, in 1853, Padre Gonzales of the Mission persuaded Captain Nidever of Santa Barbara to go in search of the last surviving Nicoleño.

Captain Nidever failed to find the woman on either his first or his second visits. However, he did find unmistakable evidence that she was still living. Thus encouraged, he made the third trip accompanied by Mr. Charles Brown and a number of Barbareño Indians. Brown landed on the southeastern end of the island—on the large sand spit. Here he arranged his Indians in line, a hundred yards or so apart, but within speaking distance, and had them move slowly forward, painstakingly combing every inch of the island. Late in the morning they came upon a hut



Limpet shells *(Megathura)*, with the centers broken out and the edges ground down, became favorite Nicoleño ornaments. Fishhooks and beads were also of shell. Other objects—whale figures, whistles, pipes, miniature canoes—were carved out of steatite (soapstone). (Courtesy Clement W. Meighan)

Indian shell-mound filled with quantities of land snails, abalones, and sea urchins. (Author)

made of whale ribs and brush, near which they found a basket of feathers. Brown ordered the Indians to scatter the feathers and temporarily abandoned the search. Later the same day, upon revisiting the hut, they found that the feathers had been replaced in the basket, but still no woman was in sight.

The next day when the search was renewed, Brown caught sight of a figure struggling up the hill toward the hut and bearing a heavy load. By the time Brown and the Indians reached the hut, the Indian woman was sitting skinning a sea lion, guarded by her dog who growled menacingly as Brown and the Indians approached. She rose as Brown drew close, and bowed toward him. When the Indians reached the hut, and saw her, they all knelt. Upon seeing people of her own race, she came toward them and offered them food. She indicated by signs—none of the Indians could understand her language—that she would have come to them, even if they had not first found her. Brown and his party spent the following month on the island and gradually learned from the lone woman how she had lived alone eighteen years by catching fish, abalones, and sea urchins which were plentiful along the island shore. She showed them how she occasionally crept up on a sleeping sea lion and killed it with a heavy rock.

On the way back to Santa Barbara, the weather was bad and the sea rough and she was much frightened. She begged the sailors to placate the wind or sea gods, or so they interpreted her signs. She recognized all the islands and had names for them. Upon landing at Santa Barbara, she was terrified at her first sight of horses and cattle and doubtless much impressed with the city itself. In all likelihood she was born on San Nicolas and had never been away before.

After her arrival on the mainland, she was cared for by Captain Nidever and quickly adapted herself to the strange ways of the people in whose midst she found herself. She became a favorite in the community and spent much of her time visiting the various Mexican families and dancing for them. The padres at Mission Santa Barbara christened her Juana Maria, to which the townspeople added Peor es Nada in memory of the little schooner that had brought her relatives to the mainland years earlier. Although the padres at the Mission had Indians from all over southern California brought to Santa Barbara, none could speak her language. Only one very old woman was even able to understand any of her words. Juana Maria Peor es Nada was therefore forced to make all her desires known by means of sign language.

After only six weeks in Santa Barbara, she sickened and died, most probably because of the great change in diet. She was about 45 years old at the time. It is reasonably certain, however, that her last days in Santa Barbara were happy ones because Captain Nidever did his best to see that she was comfortable and not in need. With her passing went the last member of a once numerous and prosperous people.

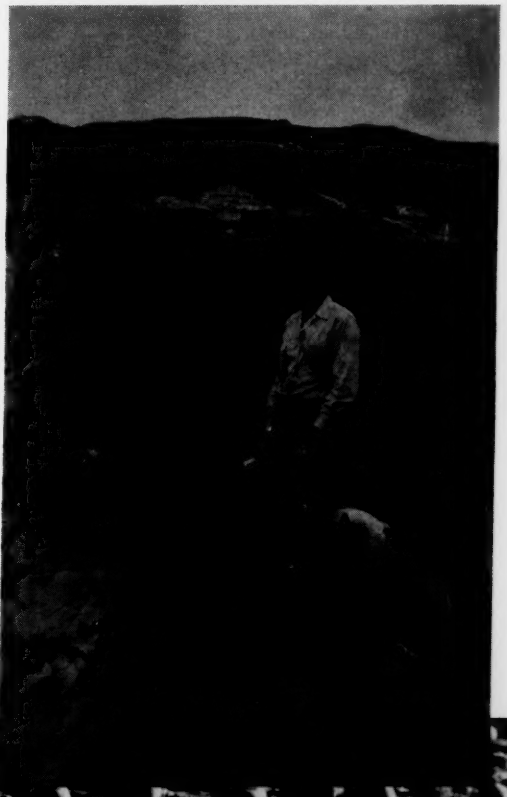
For some years after the departure of the Lone Woman, San Nicolas had no inhabitants save the foxes, mice, lizards and the more or less itinerant birds. Sometime after 1860, sheep were brought to the island and grazed by a succession of solitary herders, many of whom were Basques. As is so often the case, the efficient sheep ate the short island grass faster than it could grow, and large tracts of the island formerly protected by grass and chaparral

Abalone exposed on the rocks along the northwest coast during low tide—this was an important part of the Nicoleño diet.

were laid bare to the savage attack of wind and rain. About 1940, when the military removed the last of the herders and most of the sheep, many deep gullies and barren tracts of sand dunes had spread over areas formerly covered by short, thick island grass. Thousands of bleached, empty snail shells cover the drifting sand where vegetation once flourished. In recent years, with no sheep to interfere, the grass is gradually creeping back over the bare spots and loose sand.

Surprisingly enough, even San Nicolas did not escape the wild enthusiasm associated with the land boom of the 1880's in southern California. In 1886, an unusually optimistic real estate promoter divided the entire island into lots. It is not known whether any of these were sold, but if they were, we have no record of any owners coming to claim their share of California's desert island.

Today, San Nicolas is a Naval reservation and is closed to the public. The Indians and their dogs are gone; the sheep herders and their sheep are gone—only the descendants of the foxes, lizards and mice are there to form a living link with the past.



The author's brother, Kenneth Norris, standing beside a fretwork carved over the years in sandstone by sand-laden winds. (Author)

Some areas are covered with shells of land snails stranded by the receding tide of grass. (Author)

Canoes, Campfires, a

BENJAMIN DRAPER *Man came into the Pacific World much earlier than we thought, scienc*

RADIOCARBON or carbon 14 dating, a remarkable technique scarcely more than ten years old, is providing us with a new, accurate time-table of the history of man and the earth on which he lives. It is rapidly revising our knowledge of unrecorded periods of history.

The method is so accurate that—to cite one example—the carbon date of a three-thousand-year-old sarcophagus of an Egyptian king coincides with his known hieroglyphic history. But most remarkable of all is a new time-table for the settlement of the Pacific Islands which is being made by carbon 14 dating.

Two scientists, Dr. Alexander Spoehr, an anthropologist and director of the Bishop Museum in Honolulu, and Dr. Kenneth Emory, his associate and an archeologist, are directing the work of re-dating migrations in the Pacific. They are directing work which, for ten years now, has been yielding data of major importance in the story of man.

In 1949 Dr. Spoehr took part in a Chicago Natural History Museum expedition. Digging into an ancient campsite on the island of Saipan, he found an oyster shell, associated with bits of pottery. On Tinian Island, in the Marianas, he found another shell, associated with a skeleton. These materials were forwarded to Dr. Willard F. Libby, inventor of the carbon 14 process, at the University of Chicago.

The Saipan find yielded a radiocarbon date that placed its age at 3,479 years; the Tinian shell logged 1,098 years. These discoveries, at first unrelated, led to a program of orderly, well-planned research that is replacing guesses with provable records of man's movements across the Pacific.

After World War II, Dr. Emory, long an authority on Polynesian history, began carefully excavating old campsites. He dug out bits of charred wood and pieces of bone. With these he is re-dating the earliest Hawaiian history.

Evidence now being uncovered will provide new dates for books such as James Michener's recent novel *Hawaii.* The traditionally accepted idea that the islands were settled nine hundred years ago appears to be at least a thousand years off. Thor Heyerdahl's Kon-Tiki theory of Pacific migration from the American continent, long disputed by scientists, may be further weakened.

Digging at isolated South Point on the coast of the "Big Island" of Hawaii, among oldest known sites, Dr. Emory and his crew excavated in a place they were able to reach only by helicopter. The Bishop Museum men uncovered reliable evidence that a campfire was built and food eaten on the spot in A.D. 124.

Radiocarbon dates have also been established for other Pacific Islands—and they add up to a surprising new picture. That the migration across the vast Pacific came from Asia can no longer be doubted.

It is now believed that Micronesia was settled before 1500 B.C., and New Caledonia earlier than 1000 B.C. The Polynesians are believed to have moved into Samoa and Tonga three thousand years ago, and to have reached Hawaii by the first century of the Christian era and Easter Island about the same time.

Carbon 14 dates for New Zealand at present go back only 1,000 years, but this area may have been settled earlier than present dates indicate. The Philippines have a radiocarbon date associated with man of 2,710 years; the Island of Yap, 1,780 years. The Marquesas were settled by 122 B.C.

Carbon 14 technique for measuring the age of organic material may be applied to wood, charcoal, shells, peat, pollen, or ash—any substance containing large proportions of carbon. Since 1946, when Dr. Libby invented the process, it has become standard in a dozen laboratories all over the world. The *American Journal of Science* publishes a radiocarbon supplement in May of each year, listing dates that have been established together with pertinent details.

In the life building process vegetation gets its substance through photosynthesis, using carbon dioxide from the air. The radiocarbon in the air, derived from cosmic rays, is thus absorbed into the plant. In the case of animals these radiocarbons become a part of the body through breathing and through the processes by which animals derive body material from the plant kingdom.

The same proportion of radiocarbon exists in all three mediums—atmosphere, plants, and animals. As soon as a plant or an animal dies, the carbon 14 in it, no longer being replaced, begins to disintegrate. It decays into ordinary carbon. The rate of decay is known. After 5,700 years only half of the original amount is left, after 11,400 years, a quarter of it, and so forth.

This rate of decay has been determined to be not only steady and unchanging, but independent of the nature of the chemical compound affected and of the temperature, pressure, and other characteristics of the environment.

By measuring the amount of radiocarbon remaining in a piece of wood, a shell, or a bone, its age can be established with a high degree of accuracy. Thus

s, and Carbon 14

Dr. Spoehr's oyster shell was determined to have died on the Island of Saipan 3,479 years ago. Since it was found in association with broken pottery, it can reasonably be assumed to have been pried open, the oyster eaten, and the shell discarded.

The mechanics of measuring the degree of radiocarbon decay involve the use of a Geiger counter, and some complex equipment. A sample of the plant or animal matter is burned to form carbon dioxide. This gas is precipitated and reduced to pure carbon. Next, this sooty substance is put into a tube surrounded by the special Geiger counter which records the impulses given off by the disintegrating atoms of carbon 14. By correlating these data with the known half-life of carbon 14, constant in all substances, the age of the sample can be determined and the substance dated back to the time of its death.

When Dr. Libby first developed the procedure, he found a unique method of testing its accuracy. The Oriental Institute, also at the University of Chicago, had many wooden objects in its Egyptian collections of known dates. Using small pieces of some of these as samples, he determined their age, then compared his carbon 14 dates with the Egyptian records. The correlations were astoundingly close.

ught, science proves, as a marvelous new dating technique replaces guesswork with facts

Tree ring samples provide another method of testing accuracy. Sections of giant Sequoia trees, known to have been cut at specific dates with rings indicating ages up to 3,000 years, have been used. Innermost and outermost ring samples yield carbon 14 dates comparable to ring counts, plus or minus only a few years.

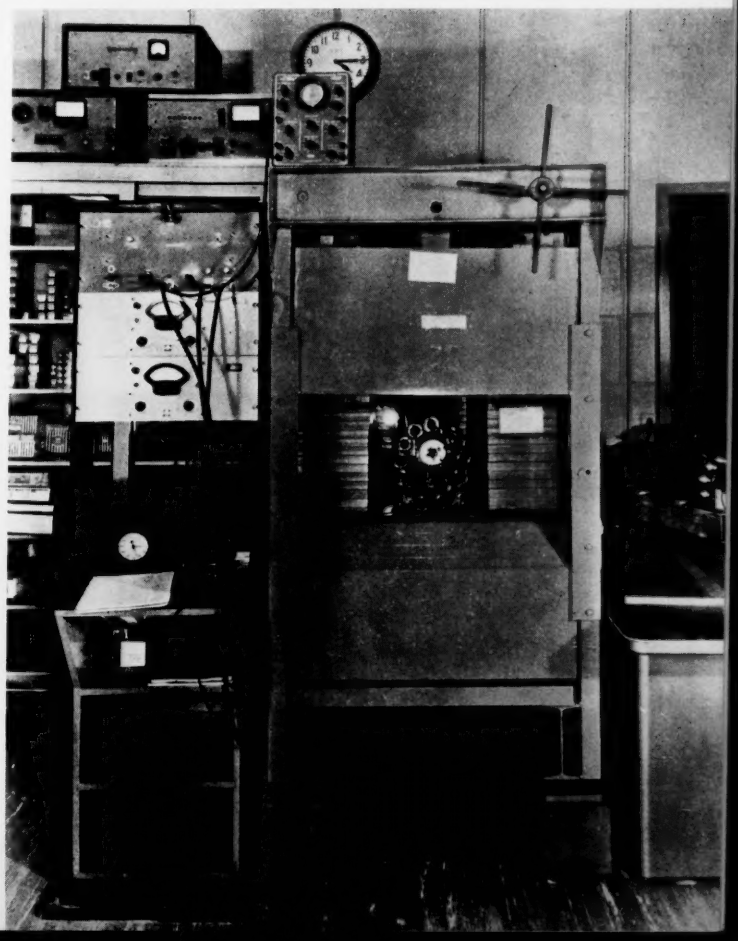
A plus or minus factor is a part of each radiocarbon date established. This device allows for known and inevitable variations which must be accounted for in the handling of the samples.

Nowhere in the radiocarbon dating technique have such spectacular results been produced as in the story of the settlement of the Pacific. The romance of man on this great ocean has been based on legends of a Stone Age people who left no written records.

Going back even earlier—to the first migration from Asia, generally regarded as the cradle of man—it has long been thought that men moved across to Australia when the sea was much lower than it is now, about 20,000 years ago. At the height of the last great glacial period, Australia and New Guinea were a single continent.

These early people had no agriculture—nowhere in the world at this time were domesticated plants

(Continued on page 18)



(ABOVE) Dr. Willard F. Libby holds the special Geiger counter which is the heart of the instrument he invented at the University of Chicago, and which (BELOW) is surrounded by an 8-inch iron shield and a ring of protective counters which shut off the central one if any outside radiation enters. (Courtesy The University of Chicago)

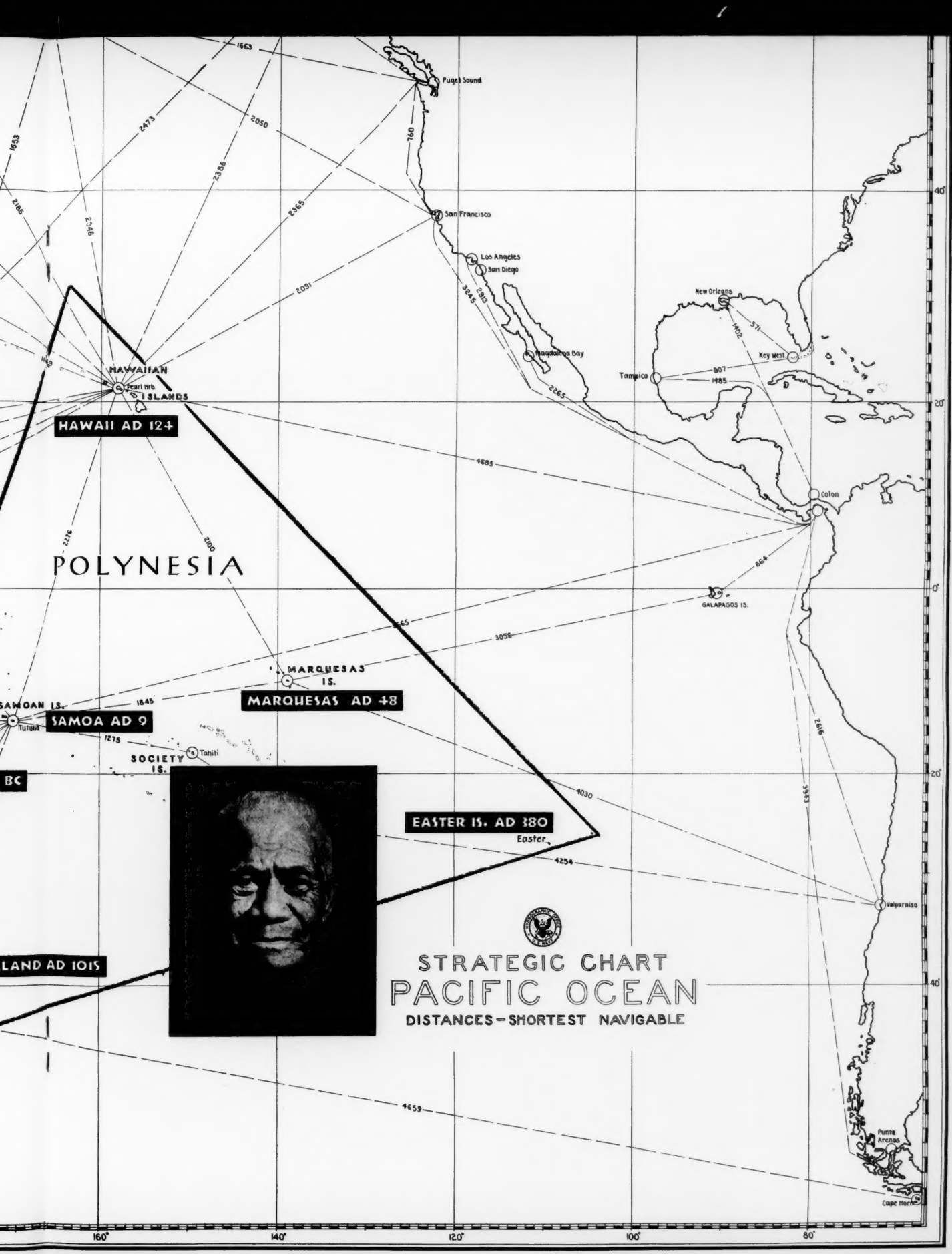
SAIPAN 1527 BC

YAP AD 178

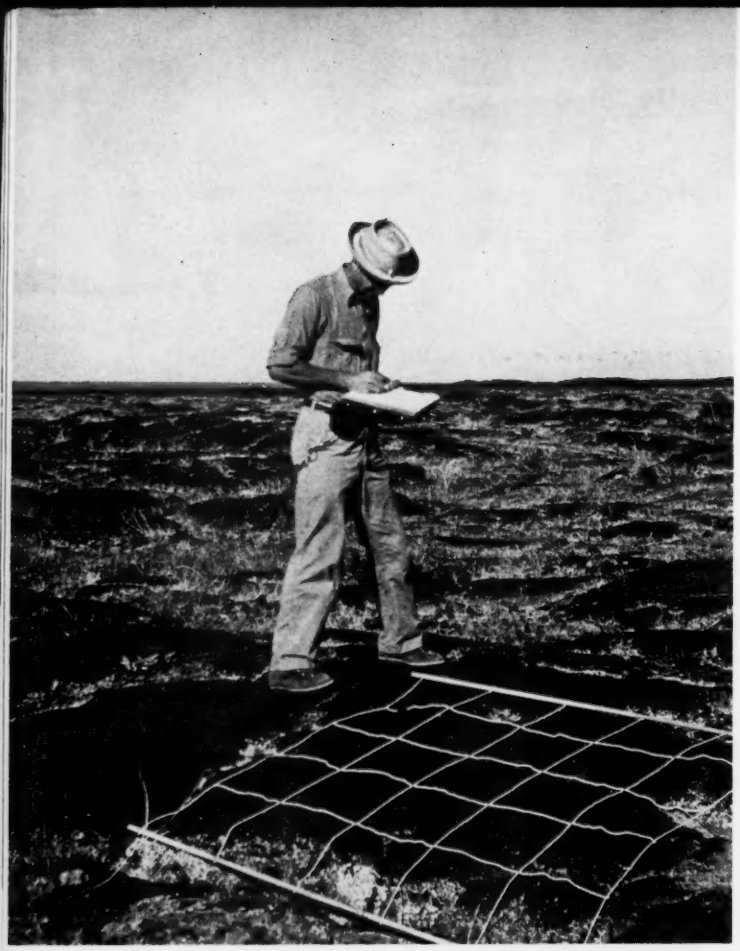
FIJI 46 BC

NEW ZEALAND AD 101

Castries Bay
La Perouse St
Broughton Bay
Tetorofu
Vladivostok
Str. of Tsugar
Port Arthur
Tsingtau
Maizuru
Yokohama
Tsu Shima
Bungo Chan
JAPAN ISLANDS
Nimrod Sd
Amami
Okinawa
Bonin Is
Midway I
HAWA
Polillo
PHILIPPINE ISLANDS
Guam
MARIANAS
MARSHALL ISLANDS
Eniwetok
Rongelab
Wotje
Mall Is
Yap
Palau
Truk
Ponape
Jaluit
Mortlock
CAROLINE IS.
MICRONESIA
PO
MELANESIA
MALAYSIA
NEW GUINEA
Simpson Hrb
Sunda Strait
Torres Strait
Port Darwin
SAMOAN IS.
Tutuila
SAMOA
FIJI IS.
AUSTRALIA
Fremantle
Sydney
Melbourne
Auckland
Wellington
100°
120°
140°
160°
180°



STRATEGIC CHART
PACIFIC OCEAN
DISTANCES – SHORTEST NAVIGABLE



known. Everywhere in the world man lived as a primitive hunter, a fisherman, and a collector of wild vegetables and fruits for food. All of Polynesia and Micronesia at this time had never been seen by man.

These islands of the Pacific were settled by some of the greatest overseas migrations in human history in terms of area covered, comparable only to the Viking voyages and the great centuries of European exploration. But we know now that the Pacific migrations began hundreds of years before these adventures of civilized European man. The Pacific was still being explored by the Polynesians during the Viking period.

The migrations of the Pacific came after man, in his long climb upward, had accomplished two things. The first was the domestication of plants, for nowhere in Polynesia or Micronesia was it possible to live off the country. There simply wasn't enough wild food. The time of domestication of the Indo-Pacific complex of food plants is still unknown but may well have taken place around 8000 B.C.

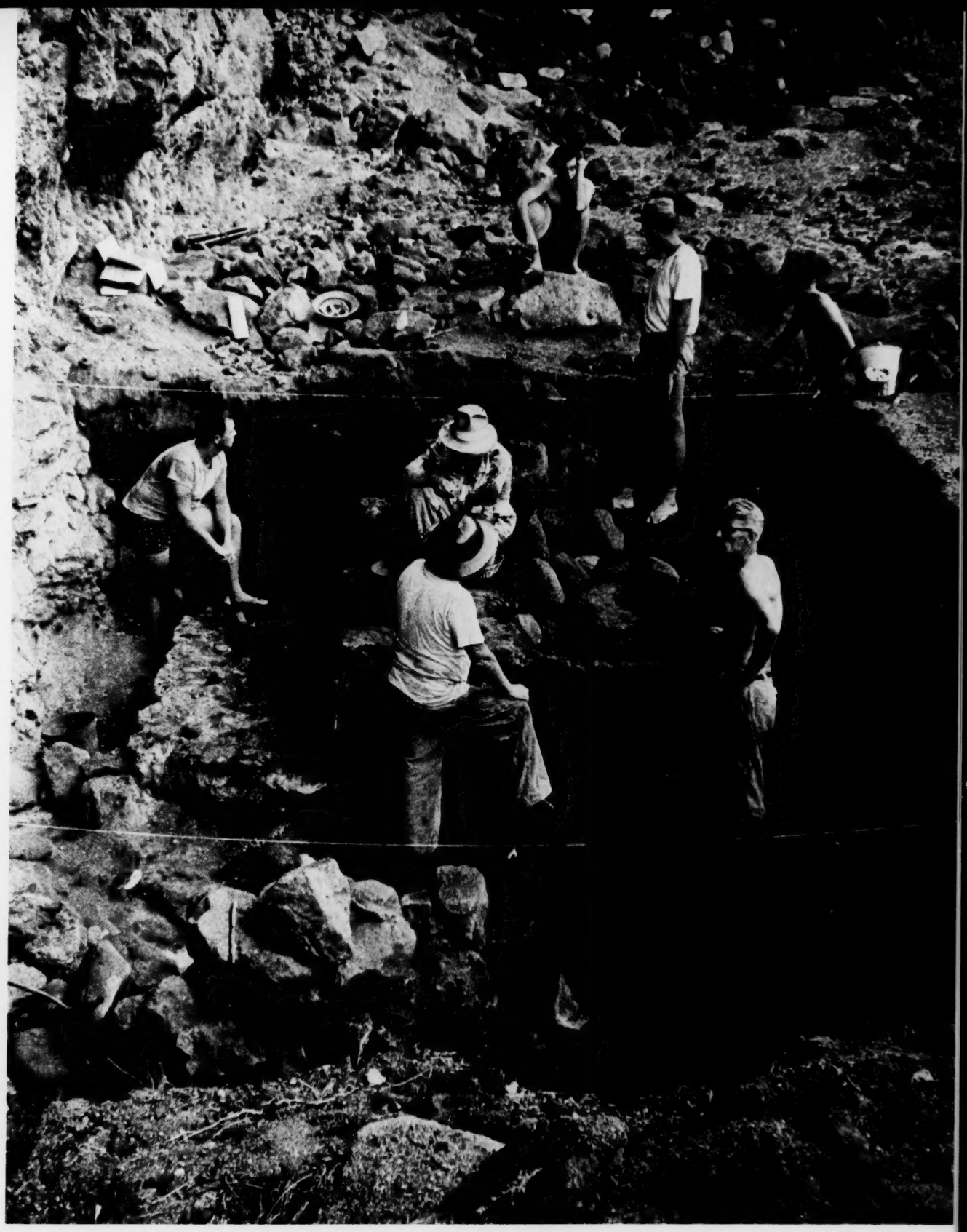
The second prerequisite was met with the invention of the single outrigger canoe and, by the Polynesians, of the double canoe. These Stone Age people wove pandanus leaves into sails of matting. They could neither read nor write nor did they have any metal but they rank among the world's greatest navigators. Sailing by the stars, according to their legends, they journeyed "into the sunrise." Thus began the sweep across the Pacific.

The double-hulled canoes, measuring up to a hun-

↑ Mr. Halley Cox, University of Hawaii associate professor of art and Bishop Museum staff member, records ancient Hawaiian petroglyphs in the Puna district, Hawaii, on a Museum archeological project undertaken for Hawaii National Park, 1959. (Anthropology Department, Bishop Museum)

→ Close-up of the dark lava slabs with their strange carved figures from an earlier Hawaiian time.

(Pacific portraits, pages 16–17, were furnished by the Bishop Museum except for the two Micronesians, which are through the courtesy of R. L. Usinger)



Bishop Museum archeological teams have dug deep into an ancient Hawaiian village site at Nualolo Kai, Na Pali Coast, Kauai. The shirtless scientist in the right foreground is the Museum's Dr. Kenneth Emory. (Robert Goodman)

dred feet, exceeded in length Sir Francis Drake's *Golden Hind* in which he encompassed the globe. Drake's complement of seventy men was about the same as the migrating population on a canoe but the Polynesians more than doubled his speed, sailing at fifteen knots and often making more than two hundred miles a day. These sailors of the Pacific surpassed the Phoenicians and the Vikings and found a new world for themselves thousands of years before Columbus.

The role that the domestication of plants played has been deduced by botanists. Breadfruit and bananas can be propagated only from slips. Taro and the sweet potato grow from tubers. Since none of these plants have seeds that could fly by air, float by sea, or be carried by birds, it is suggested that they were taken to far islands by men who knew how to make them grow.

All these Pacific food plants are natives of Asia except for one, the sweet potato, which came from South America. Captain Cook found all these plants under cultivation in Hawaii when he visited the Islands in 1778. Similarly, the pig and the chicken, of Asian origin, were established in Polynesia long before they reached America in European times.

Thor Heyerdahl, of *Kon-Tiki* and *Aku Aku* fame, has long sought to establish the theory that the Pacific Islands were settled from the west coast of South America by migrations from that direction. The principal evidence he offers is the sweet potato.

The arrival of the sweet potato in Polynesia from South America was postulated by some scientists twenty years and more before Heyerdahl's time. Adventuring Polynesians who, centuries earlier, had crossed the unknown sea from Tahiti to Hawaii in their great double canoes, could easily have sailed, again toward the sunrise, to the west coast of South America. Here they would have provisioned their ships with such foodstuffs as were available, the sweet potato and perhaps the gourd among them, and returned home. It has also been suggested that American Indians may have brought the sweet potato, on drift voyages like Heyerdahl's own *Kon-Tiki* journey.

Prior to 1954, Dr. Emory had found charcoal from early Polynesian culture on the island of Oahu which yielded a carbon 14 date of 946 plus or minus 180. This was the first radiocarbon date determined for a Pacific island. But his newest find on the "Big Island," dating a campsite at A.D. 124, remains one of the most important in the history of this new and accurate method of dating the past.

"The time scale of human settlement of the Pacific will be greatly revised in the next few years," says Dr. Spoehr. As new carbon dates provide evidence of the routes and the times of man's migrations over the face of the earth, the Pacific voyages will undoubtedly have a more prominent place.

"Bear-Crank" CALIFORNIANS

URSUS *HORRIBILIS* was an apt name for the California grizzly, and most pioneers, if they did not view him with absolute horror, at least gave the beast as wide a berth as possible. The major exceptions were in the case of a handful of *vaqueros* who, full of adventure or *aguardiente*, were not above riding into the foothills, roping a grizzly, and dragging him into a settlement for a bull and bear fight. *Gringo* Forty Niners were often good bear hunters but they tended to give old *Ursus horribilis* the respect due him unless they were particularly "bear crank," as the saying went.

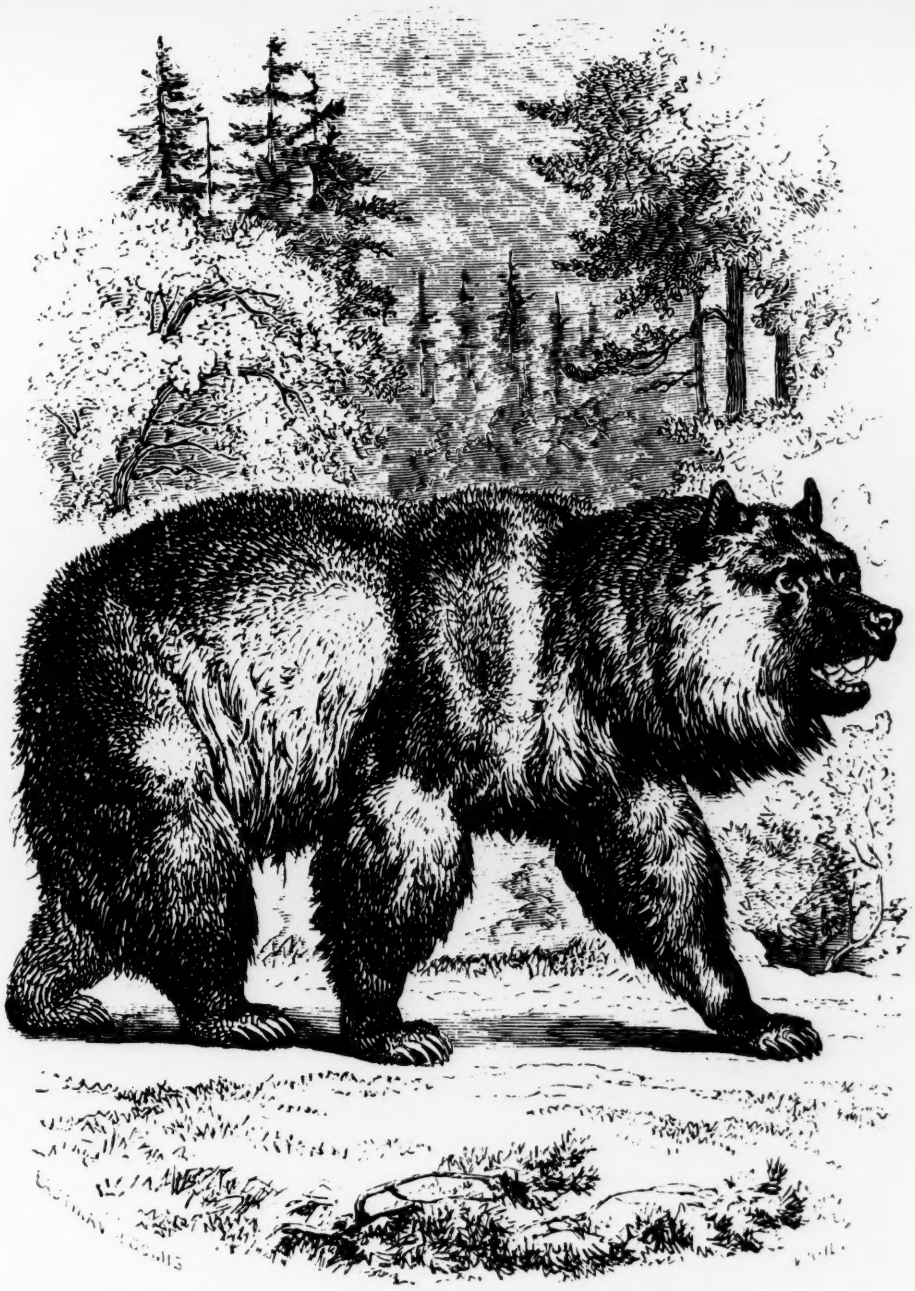
James Capen ("Grizzly") Adams was more than a little "touched" on the subject of bears. He captured two grizzly cubs, Lady Washington and Ben Franklin, and tamed them so thoroughly that they not only became his constant and inseparable companions—ursine versions of "man's best friend"—but insisted on carrying his packs on the trail and sleeping alongside him to keep him warm. Moreover, Ben Franklin actually saved Adams's life when he was attacked by a wounded wolf, the grizzly dispatching the *lobo* with one sweep of his mighty paw. It is estimated that Grizzly Adams killed seventy grizzlies and black bears during his Sierra years. The largest grizzly he ever saw he captured and named Samson, but he was too old to tame and Adams kept him in a secure cage.

Adams and his unmuzzled bears used to parade the streets of San Francisco and their fame spread so far that the old mountain man was invited by P. T. Barnum to bring his menagerie to New York. It was while traveling in New England in 1860 that Adams died and his body, battered by dozens of hand-to-hand battles with the most ferocious animals of the West, was laid to rest.

The Sonora pioneer of 1850 known only as Old Doty was even more "bear crank." He was not content to set spring guns all over his property but would also go off on hunts bearing two rifles. When his friend, Benjamin Butler Harris, warned him that he'd likely lose his life to a bear in the space of time it would take him to set down one gun in order to aim the other, he answered simply, "Why, man alive, the more balls, the more bear!"

One day Doty was tramping through the brush ten miles from his ranch when a grizzly reared up in the chaparral and struck him down as he was lowering one of his rifles to the ground. The monster then began tearing at him. Fellow hunters and a dog frightened the bear off but not before the sagittal suture of Doty's skull was parted and the suture of his breast-

RICHARD H. DILLON



bone likewise. He was also bitten through the arm, the hand, and the leg, with the ends of sinews broken by the savage tusks exposed in his thigh.

Harris and the others carried him home in a blanket ambulance to die where he could be afforded decent burial. About two months later, however, Old Doty hobbled into Sonora, gun in hand. He greeted his friends, "Boys, don't you want to go arter bar? Man alive, when the tarnal critter had me down, biting me, I thought he would kill me alive! I'll follow the tarnal critters all the rest of my born days. Gaul darn if I don't! Wasn't he a gritty old fellow?"

Grizzly Adams' largest capture, "Samson"—over 1,500 pounds of California grizzly bear.
(From *The Adventures of James Capen Adams, Mountaineer and Grizzly Bear Hunter of California,* by Theodore H. Hittell. Charles Scribner's Sons, New York, 1926. Courtesy of the Sutro Library)

NATURE offers much to see and enjoy in the West during May and June. Nesting birds are with us again and their songs fill the air from coastal marshes and desert valleys to Sierra forests and barren arctic-alpine rock-piles of granite. Lizards and other reptiles are active once more from desert and valley lowlands to mountain tops. Insects are here again in myriad numbers and varieties. The plant world is bursting with beauty and that is what we will focus on at this time. The earliest spring flowers have now bloomed and faded but more are to come. May and June are especially good wildflower months, for many of the April flowers still persist, and some of the July flowers are off to an early start. Blossoming dates can be misleading if taken too literally. Seasonal weather differences can alter them, and don't forget that the same species may bloom in a canyon in the foothills just east of the San Joaquin Valley in April, in the Santa Cruz Mountains in May, and in the Sierra Nevada in June.

WATCH FOR—— Spring-Summer Flower Show

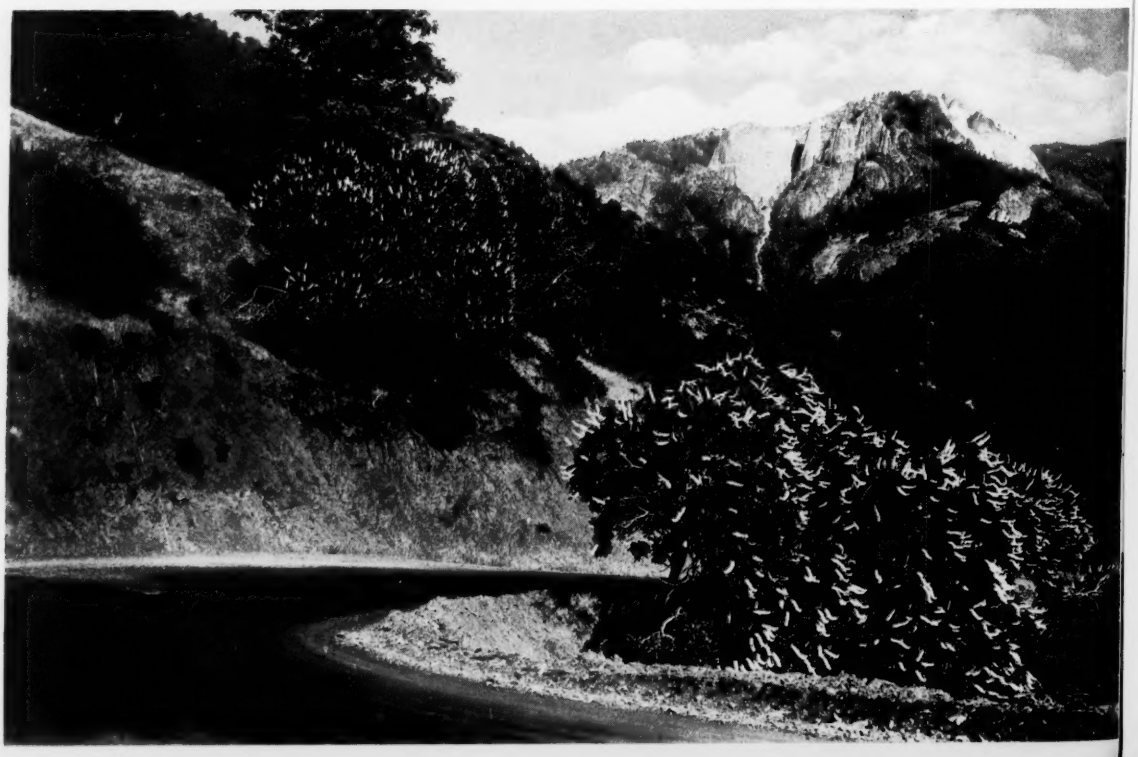
California Buckeye (***Aesculus californica***). Undoubtedly the showiest native flowering tree of May and June in the West is the California Buckeye. It is also one of the most interesting of western trees. The poisonous buckeye seeds were ground up and used by the Indians to kill fish. They also leached out the poison and made the ground-up seeds into flour. Buckeyes are widely distributed in foothill woodlands of the Coast Ranges and Sierra Nevada.

Pacific Dogwood (***Cornus nuttalli***). Also called Mountain Dogwood, this attractive shrub, commonly also of tree size, is found in mountain woodlands between 1,500 and 6,000 feet in elevation from San Diego County north to British Columbia and Idaho. The delicate white blossoms tinged with pink may be found from April to July.

Snow Plant (***Sarcodes sanguinea***). **Pinedrops** (***Pterospora andromeda***). The conspicuous red Snow Plant and the purple-brown Pinedrops may be found growing in the rich humus of pine forests in the western mountains. Look for Snow Plants from May to July and Pinedrops from June to August.

Yellow Mariposa Lily (***Calochortus luteus***). This beautiful deep yellow lily provides good reason for the Spanish calling these flowers *mariposas* or butterflies. They are most frequently found in hard, gravel-packed soils in the foothills of the Coast Ranges and Sierra Nevada below 2,500 feet during May and June.

California Buckeye, flower stalk and leaf cluster.



Q & A——Wildlife, Wildflowers, White-tailed Kites

THE NATIONAL AUDUBON SOCIETY, with headquarters in New York City, maintains an outdoor nature education center and sanctuary at El Monte near Los Angeles, a natural science and conservation summer camp at Sugar Bowl Lodge near Donner Summit in the High Sierra, and the Conservation Resource Center at 2426 Bancroft Way, Berkeley, California.

When the phone rings or the door opens at the Audubon office in Berkeley it may be a school teacher, a scout or other youth leader, a distraught mother, a newspaper reporter, a senior citizen, or an ambitious youngster—all calling for the same reason: they want help on some problem in nature study or conservation.

The questions below and thousands more like them have been asked and answered at the Audubon Conservation Resource Center in recent months.

QUESTION. *How do I make a wildlife sanctuary out of my 75 acres?*

ANSWER. This, like most inquiries to Audubon elicits more questions: what is the cover? is there running water? what is the previous (and anticipated) use? what is the elevation? is there fencing—what kind, how much? etc. Many persons know "sanctuary" as a preserve for a certain species of wildlife, without consideration of the interdependence of all living things, or the necessity of proper habitat for a certain species, or the ramifications of wise management in sanctuary or refuge use. A sanctuary is a place where wildlife may come to rest; a refuge, where wildlife will have a permanent home. Certain areas are far better suited to one use than the other. In a self-contained sanctuary or refuge community trees, shrubs, insects, soil, water, birds, insects, mammals, must all be considered in their interdependent whole—the balanced web of life. Audubon has readily available lists of state and federal agencies which can be of assistance in a given area; also books and pamphlets on native plants, on habitat requirements, on wetland and marsh concerns, on the role of the predator, etc.; and welcomes inquiries and use of the Center's browsing room. PHYLLIS LINDLEY

QUESTION. *At my duck club in the Suisun marshes there is a white hawk that does a lot of hovering, and then drops straight down feet first and wings up. It is about the size of a marsh hawk but doesn't fly like one. Some of the members say we ought to shoot it before it gets the young pheasants. Can you tell me what it is and what we should do about it?*

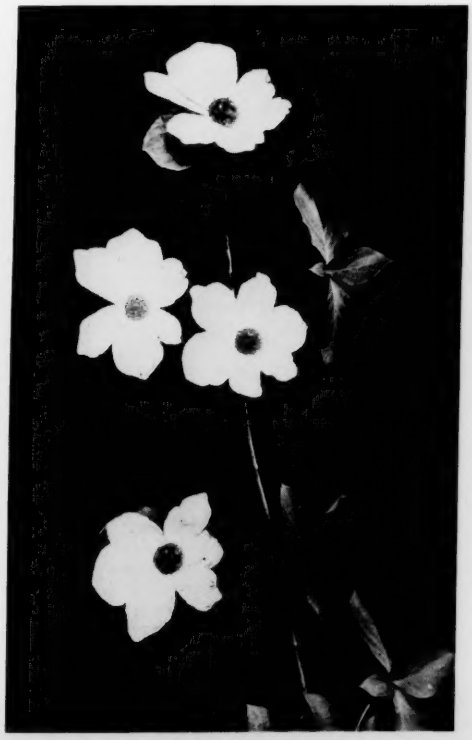
ANSWER. Whatever you do, don't kill it! That hawk is a white-tailed kite (*Elanus leucurus*). It is protected by law (as are all hawks in California). In the case of the kite, this protection is especially necessary because this beautiful species was almost extinct not many years ago and is only now beginning to make a comeback. Its habit of hovering over marshes and fields has made it too easy a target for uninformed gunners. Crop and stomach content studies have shown that the white-tailed kite lives on small rodents and insects and hardly ever takes a bird. So you needn't worry about it catching pheasants. The marsh hawk (*Cirus ovaneus*) may occasionally take young pheasants, but it more than makes up for this by eating ground squirrels and rats which would otherwise destroy many pheasant eggs. The best way to increase game bird populations is not to shoot hawks but to improve the habitat by maintaining adequate cover, forage, etc. The marsh hawk also performs a service by killing sick and wounded birds. If you duck hunters watch the marsh hawks carefully, they will lead you to many a crippled duck which might otherwise be lost. STERLING BUNNELL

QUESTION. *What is the best way to mount wildflowers for my home collection?*

ANSWER. Again, more questions: how will the collection be used? is a child doing it? is it an adult research project? are you showing special parts of the flower? do you have a vasculum and plant press? etc., etc. A Cub Scout may mount flowers on 3x5 cards with overlaying strips of scotch tape firmly pressed over the flower, labeling each card with the common and scientific name; and then make a "booklet" of the cards by punching a hole in the corner of each, and holding the "pages" together with a binder ring—an excellent trail diary. The scientist may use a plant press and herbarium sheets or perhaps imbed the specimen parts in plastic. The photographer will mount his collection in an album, or file slides, and so on. Nature hobbies are equally engrossing and rewarding to child, adult, scientist and amateur—if the project is adapted to the age and interest of, and materials available to, the individual.

All collectors must know the rare flowers in an area (as well as applicable laws in parks, by roadsides, etc.) and in all cases will follow the good sense rule: Pick, if you must, one flower face *if* nine more blooms are left in place. One foot square must hold that many; otherwise look, but don't pick any!

Other home collections include crayon, ink and ozalid prints. Seaweed specimens have a special mounting procedure using the mucilage in these algae. Whatever the specific problem, Audubon answers aim to stimulate original observation and research, and provide references to books or pamphlets designed to be most helpful in the particular situation. MARY JEFFERDS



Pacific Dogwood. (All photos by Gayle Pickwell)

Buckeye trees along the highway to Sequoia National Park, with Moro Rock in the distance. Taken in June.

SHORT HISTORY OF THE REFLECTING

Guest Author:
MEARL F. CARSON

IN THE MOST GENERAL TERMS there are two kinds of astronomers: there are those who sit and think – theoretical astronomers, and those who observe – observational astronomers. Of course, there are degrees of mixtures of these two, and there are very few purely theoretical men. Bondi, of Cambridge University, often states he has made but one observation in astronomy, that is, he has observed that it is dark at night! Despite just this one observation he developed his theory of the distribution of matter in space, in the whole universe.

No really great strides were made in either observational or theoretical astronomy until the invention of the telescope. The ancients were able to map the stars, record their proper places in the heavens, and give them names which usually had some reference to mythology. Once in awhile acute observations gave some clue to the nature of a star. The old observers could distinguish between the wandering stars (planets) and fixed stars. They could record eclipses and the coming of a comet. Beyond that, without the telescope, they could not go.

The telescope as an instrument is relatively modern, dating back only to 1608, but the lenses necessary for its invention were in use 300 years earlier. A Florentine manuscript of 1289 refers to "those glasses [lenses] they call spectacles, lately invented, to the great advantage of poor old men when their sight grows weak." Of course, lenses were impossible until the development of glass. Specimens of Egyptian glass are in existence which can be dated back to about 2400 B.C. In Egyptian sculptures of 4000 B.C. glass bottles are undoubtedly represented.

A telescope is an optical instrument for enlarging the image of a distant object on the retina of the eye, or if the object is a point of light, for increasing its brilliancy. The telescope consists of essentially two parts: an objective glass or mirror for forming an image of the object, and an ocular, or eyepiece, for viewing this image. The word "telescope" is derived from the Greek words *tele,* which means far, and *skopein,* which means to see.

The telescope appears to have been invented by Jan Lippershey, a spectacle maker of Middleburg, in Zeeland, in 1608. Galileo, hearing of the invention, constructed an instrument for himself and was the first to use the telescope as a research instrument. With an instrument magnifying thirty-two times he began in 1610 the notable succession of discoveries that laid the foundation of observational astronomy. A serious fault of the Galilean telescope was its very small field of view at any considerable power. Galileo's largest instrument had a field of but seven minutes, fifteen seconds, less than a quarter of the moon's diameter. This fault was remedied by Johann Kepler who substituted a convex lens in the eyepiece for the concave lens that Galileo used.

There are two classes of telescopes, the refractors and the reflectors. The *refractor* transmits the rays to a focus through a combination of lenses called the objective glass; the *reflector* brings the rays to a focus by reflection from a concave mirror. In both kinds the real image thus formed is viewed through a magnifying eyepiece.

Reflecting telescopes are superior to refracting instruments in that they are easier and less expensive to construct, they can be made larger in size, and they do not suffer the fault of "chromatism" of the refractor. This latter fault is a failure of the lens to bring all colors of light to a focus at the same point. A mirror does not produce this error. The glass for a mirror need not be perfect all the way through since only its front surface is used. This greatly reduces the difficulty of casting the mirror blank and lowers the cost as well. Further savings result from the fact that only one surface of the mirror must be ground and polished, while a lens consisting of two pieces of glass has four surfaces that must be ground and figured. The size of a lens is limited because it can only be supported around the edges so that light may pass through. A large lens may sag under its own weight and become distorted. This unhappy fact limits the 40-inch refracting telescope at the Yerkes Observatory in Wisconsin to being used at no more than 60 degrees above the horizon. When it is directly overhead the lens sags enough to seriously impair the image. A mirror can be supported over its entire back, so flexing is prevented. A newly aluminized mirror reflects more light than is transmitted by an air spaced doublet lens of the same area. A non-reflecting coating would shift the advantage back to the lens in

24 **Isaac Newton's reflecting telescope made in 1671 and now in possession of the Royal Society, London. (Science Museum, London, Crown copyright res.)**

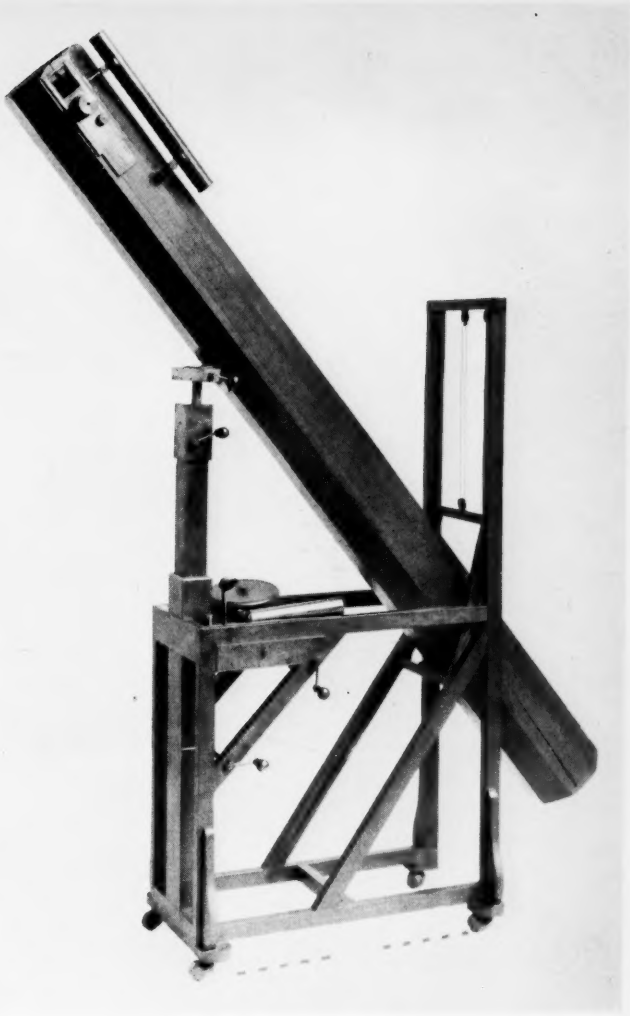
TELESCOPE

this respect, but no one would think of coating a lens the size used in the 36-inch refractor at the Lick Observatory in California.

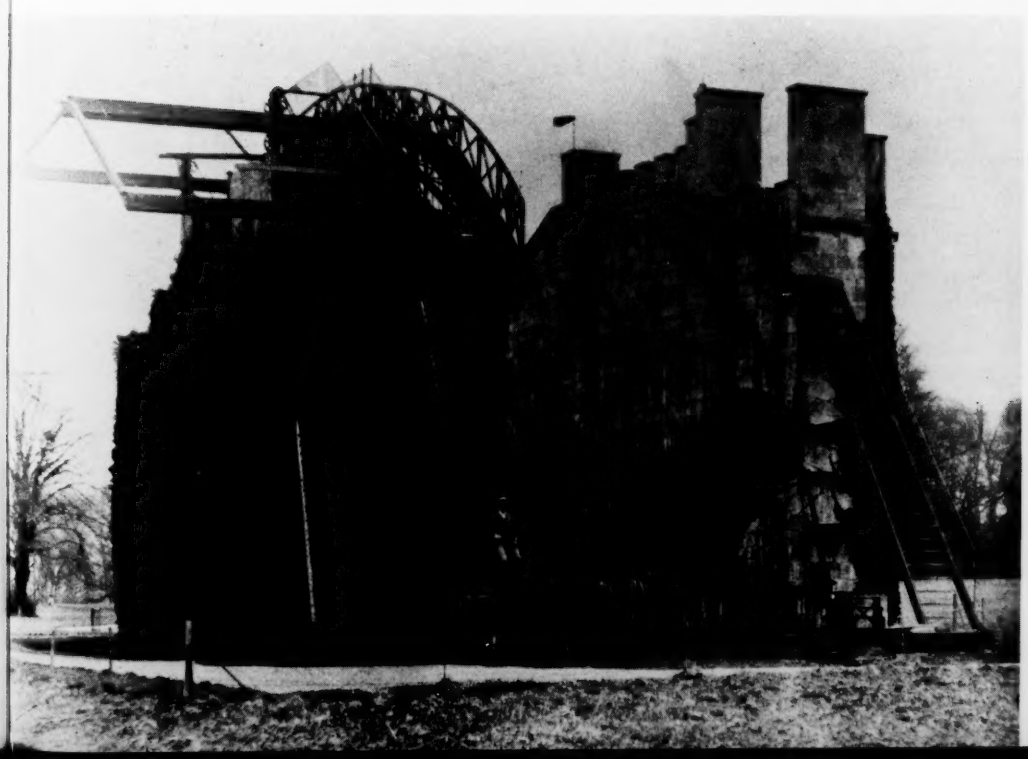
In 1663, James Gregory, a famous Scottish mathematician, published his *Optica Promota,* in which he described the rather elegant construction which bears his name. This telescope had a perforated parabolic mirror with an elliptical mirror forward of the focus returning an image to the ocular through the perforation. It was convenient in that it gave an erect image, and it was sound theoretically. The future proved it sound practically, but its curves were quite too much for its contemporary opticians.

A great influence on the art of telescope making attended the next attempt at a reflector, by Isaac Newton. This was an early outcome of his notable discovery of the dispersion of light by prisms, which led him to despair of improving refracting telescopes and turned his mind to reflectors. In 1671 he presented to the Royal Society a small model of his device which was received with acclamation and then lay forgotten on the shelf for half a century. In making the mirror of his telescope Newton had to obtain a metal of suitable hardness and reflectivity. His choice was an alloy well known to the alchemist of his time, a mixture of six parts copper, two parts tin, that had a brightness similar to silver. The high copper content caused it to tarnish rapidly and he had to repolish his mirrors from time to time to restore their original lustre. This problem continued to plague telescope makers until a way to silver glass was discovered 200 years later.

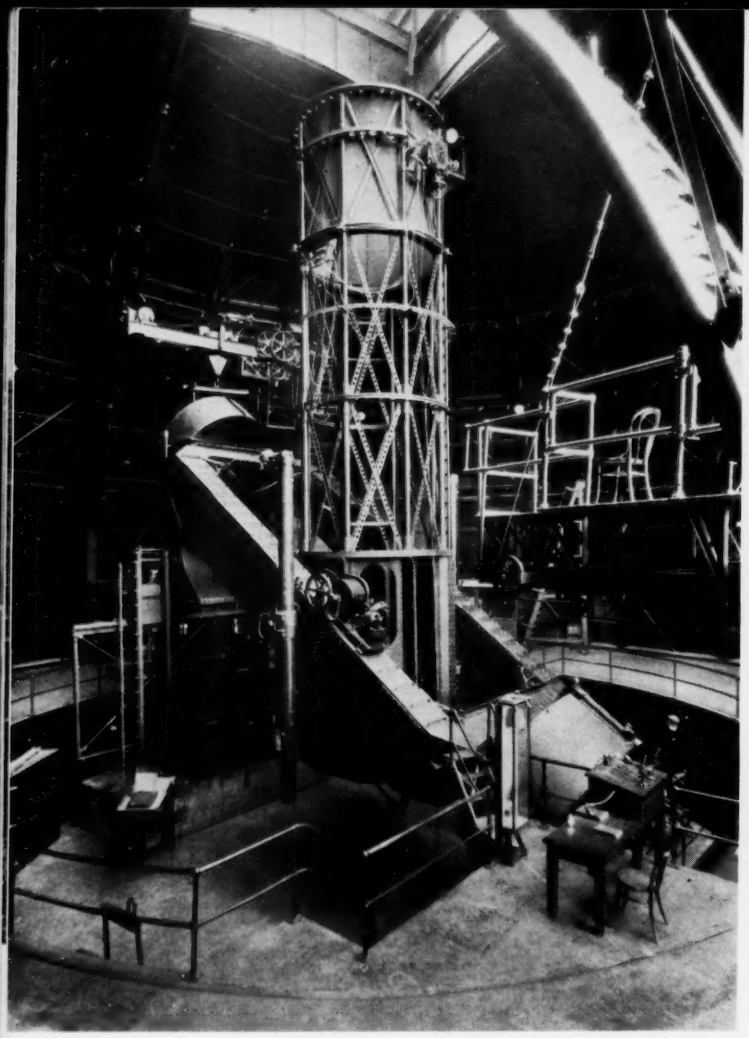
About the beginning of the year 1672, M. Cassegrain communicated to M. de Berce a design for a



↑ The telescope with which William Herschel discovered the planet Uranus in 1781. The 7-foot wooden tube houses a mirror 6.2 inches in diameter. (Science Museum, London, Crown copyright res.)



← The Earl of Rosse's 6-foot reflecting telescope with which astronomers studied many distant objects. It was completed in 1845, dismantled 53 years later. The mirror is now in London's Science Museum. This photograph was taken in 1845. (Science Museum, London, Crown copyright res.)

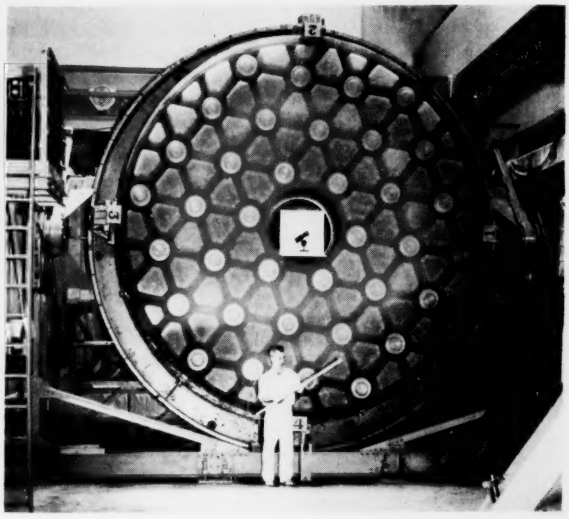


The 100-inch Hooker reflecting telescope at Mount Wilson Observatory, California, can be used as either a Cassegrainian or a Newtonian reflector—but not both at the same time. (Mount Wilson Observatory)

reflecting telescope which eventually found its way into the *Philosophical Transactions* of May, in that year, after previous publication in the *Journal des Sçavans.* It differed from Gregory's construction in that the latter's elliptical concave mirror placed outside the main focus was replaced by a convex mirror placed inside the focus; the image was therefore inverted.

In the face of the seemingly impossible task of figuring a parabolic mirror surface, nothing further was done and the instruments of Gregory, Newton, and Cassegrain fell into disuse for about fifty years. In due time the new order came, and with astounding suddenness: in 1722 John Hadley presented to the Royal Society the first reflecting telescope worthy of the name. He took the essential step at which Gregory, Newton, and the others had stumbled. He parabolized his mirror. The instrument he presented was of the Newtonian type and with magnification up to 230 power.

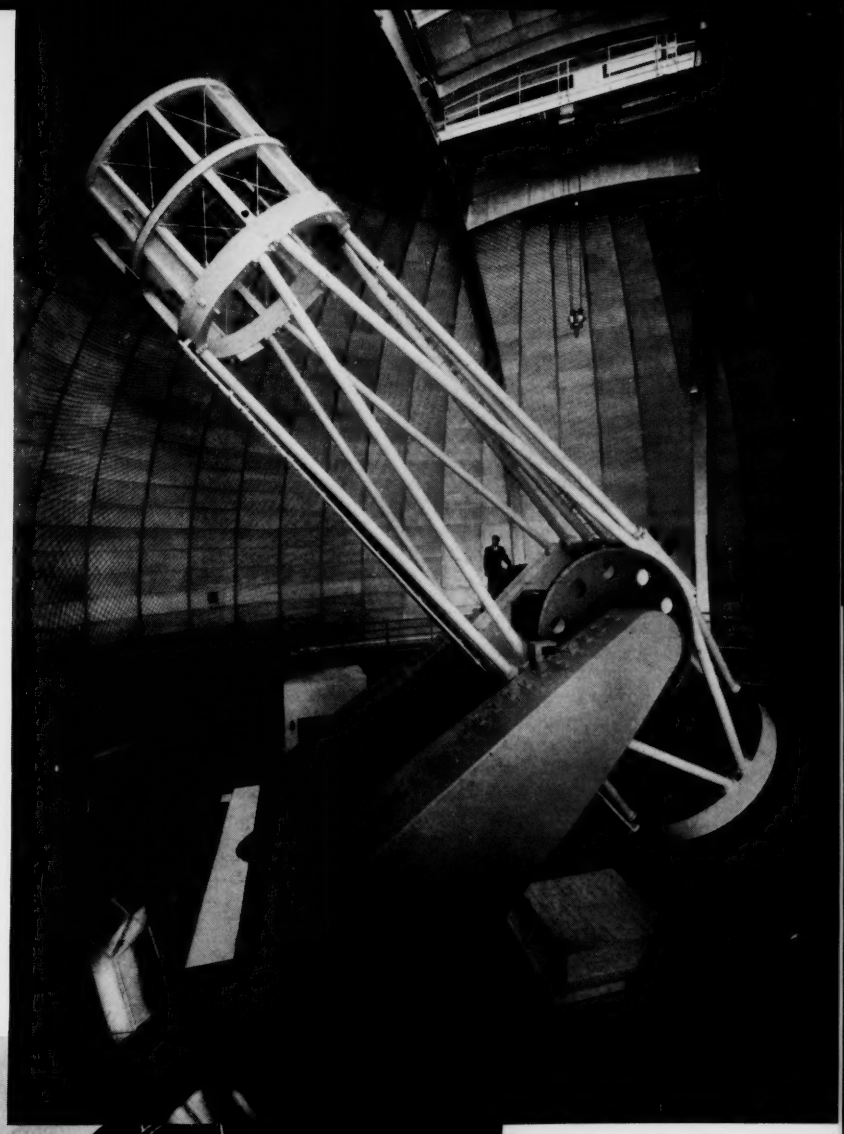
The chief link between the old and new in instrumental as well as observational astronomy was Sir William Herschel. In the first place, he carried the figuring of his mirrors to a point not approached by predecessors, and secondly, he taught by example the immense value of aperture in definition and light-gathering power. William Herschel was a poor German organist living in England who had a passion for astronomy. In order to make some sort of a living he gave concerts, then hurried home to study the



↑ (ABOVE) Mount Palomar Observatory's beautiful dome rises to a height of 137 feet above the near-summit of the mountain. (BELOW) The 200-inch mirror of the Hale reflector, in testing position 12 years ago, dwarfed a replica (in center) of its ancestor, Isaac Newton's reflector. (Photographs by the late Edison R. Hoge)

↑ Housing of the new 120-inch reflector at the University of California's Lick Observatory on Mount Hamilton, the telescope visible through the shutter of the 96-foot dome. (Lick Observatory)

→ The 120-inch Lick reflector, completed in 1959, the workman standing on the fork behind the open tube giving a good idea of the size of the world's second largest telescope. (Lick Observatory)



The giant eye of the world—the 200-inch Hale reflector—rests at the base of the yoke, between the two huge tubular arms. It is covered by its shutter. The telescope cage projects beyond the horseshoe, supports the prime focus cage (pointing uppermost, left) in which the observer rides. (Edison R. Hoge)

stars. Unable to purchase a telescope of the size and perfection he desired, he began making his own instruments. A dedicated and persistent worker, he once toiled sixteen hours polishing a mirror while his sister from time to time fed him hot soup with a spoon. It was with this telescope he discovered the planet Uranus in 1781, and became private astronomer to King George III. Years later he was knighted for his achievements in astronomy. His greatest mirror was 48 inches clear aperture, and of 40-foot focal length. The completion of this instrument, which would rank as large even today, was rewarded by the immediate discovery of two new satellites of Saturn, Enceladus and Mimas.

The last great reflector of the 19th century was constructed by the Earl of Rosse. This remarkable and mighty instrument had a mirror six feet in diameter with a total reflecting surface of 4,071 square inches and weighed over three tons. Its focal length was 52 feet, but the tube, made of wood, was 56 feet long, including the mirror cell. The whole instrument weighed over 15 tons. It was fixed to a large universal joint imbedded in masonry about six feet below the surface of the ground. Raising or lowering it to sweep the sky was done by a chain and windlass. On each side of the tube, in line with the meridian, was erected a stone wall 72 feet long and 48 feet high allowing lateral movement of the telescope.

The next great step in the development of the telescope was the discovery of a simple chemical process for silvering glass. Up to this time all telescope mirrors had been made of metal. This had the disadvantage of weight and the polished surface tarnished rapidly. The first silver-on-glass reflector was constructed in 1856 by Dr. Karl August Steinheil. Early the next year Jean Bernard Leon Foucault made public his methods of grinding and testing parabolic glass mirrors. The Foucault test is a simple but delicate test capable of revealing irregularities in the curve of a mirror of less than a millionth of an inch. His method of testing is now universally employed.

Until about fifteen years ago mirrors were coated with silver which was chemically deposited on the surface. Since World War II most telescope mirrors are coated with aluminum deposited by evaporation and recondensation in a vacuum. When such a surface is first exposed to the air a transparent coating of aluminum oxide is formed which protects the surface from tarnishing for a considerably longer period of time than silver coating.

Until the close of the nineteenth century all large reflecting telescopes were constructed in Europe. Since 1900, aided by public-spirited citizens, the United States has taken the initiative in the development of these huge instruments of research.

The first large reflector put into use in America was the 60-inch telescope at the Mount Wilson observatory near Pasadena, California. This instrument was completed in 1908 and has been in continuous service for half a century. Nine years later the 100-inch Hooker reflector was added to the array of astronomical equipment at Mount Wilson. It is a massive instrument; the parts which move when it is set to follow an object across the sky weigh 100 tons. To move the quantity of glass and steel with precision a great driving clock actuated by a weight of three-fourths of a ton is set below the level of the floor. By means of a worm gear 17 feet in diameter the slow and precise motion of the driving shaft of the clock is transmitted to the telescope.

In 1939 an 82-inch telescope of unique design was completed at the McDonald Observatory on Mount Locke in Western Texas. On photographs taken in 1948 with this instrument an additional moon of the planet Uranus was discovered.

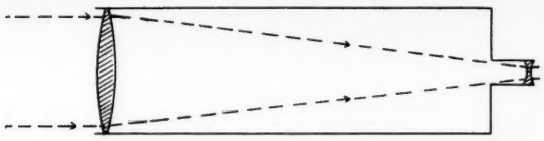
The greatest of all telescopes, the 200-inch Hale reflector, was officially dedicated in 1948. Located at a favorable site on Mount Palomar, it is within convenient distance of Mount Wilson. The 17-foot mirror, weighing 16 tons, is of Pyrex glass. Because it is subject to less distortion by temperature variations and bends less under its own weight Pyrex was used in place of plate glass. During the grinding and figuring process 31 tons of abrasives were used to remove five tons of glass from the mirror blank. A novel feature of this instrument is that the astronomer rides inside the telescope when observing at the prime focus. The observing cage is located at the upper end of the tube, about fifty feet above the mirror.

In 1959 the 120-inch telescope at Lick Observatory on Mount Hamilton in California began scanning the further depths of space. The mirror of this instrument was made from a Pyrex blank that was originally intended to be used in testing the 200-inch mirror.

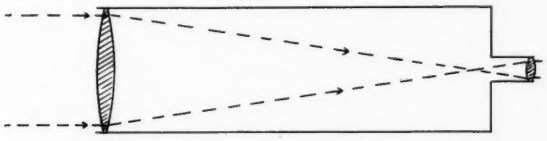
By way of comparison, the two largest refracting telescopes in the world are the 36-inch at Lick Observatory, completed in 1888, and the 40-inch at the Yerkes Observatory, Williams Bay, Wisconsin, finished in 1897.

No story of the development of large telescopes in America is complete without the mention of George Ellery Hale. A natural leader of men, he succeeded four times in raising funds for the construction of large telescopes. The 40-inch Yerkes refractor, the 60-inch and 100-inch Mount Wilson reflectors, and the 200-inch Mount Palomar reflector were made realities through his leadership. Although Hale died before its completion, the great 200-inch telescope was named in his honor.

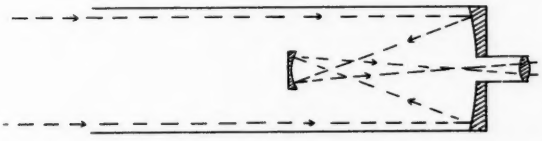
The telescope is certainly one of the noblest monuments to human genius, and its invention will always be considered among the most remarkable in the circle of human knowledge. It is a work in which, by following unconsciously the plan of nature in the formation of the eye, we have come the nearest to the construction of a new organ of sense. By means of it we have extended our views and researches far beyond the limits of our own globe, enabling us to penetrate into the immensity of space and to become familiar with other worlds placed at almost incomprehensible distances from us. The telescope has revealed an infinitude of celestial bodies, whose existences must forever have remained unknown to us but for its invention.



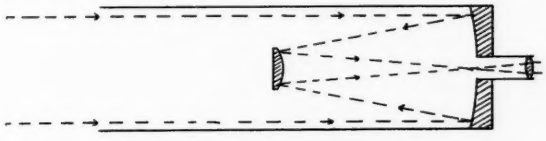
The Galilean telescope, in which the starlight passes through a converging (convex) objective lens and the image is viewed through a double concave eyepiece inside the principal focus.



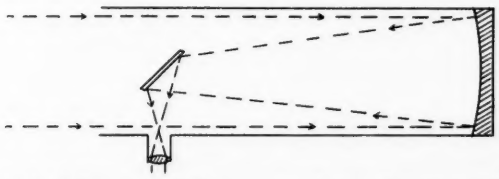
The Keplerian telescope, in which the starlight passes through a converging (convex) objective lens and the image is viewed through a double convex eyepiece outside the principal focus.



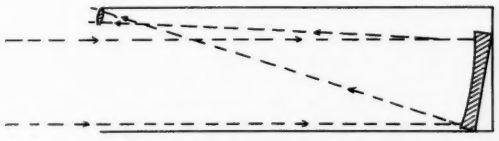
Gregorian telescope, in which starlight is reflected back along axis by a small concave secondary mirror, and is viewed through an eyepiece at a hole in the center of the large concave primary mirror.



Cassegrainian telescope, in which starlight is reflected back along axis by a small convex secondary mirror, and is viewed through eyepiece at a hole in the center of the large concave primary mirror.



Newtonian telescope, with the concave primary mirror perpendicular to axis; reflected starlight falling on inclined flat secondary mirror is turned out to an eyepiece on the side of the tube.



Herschelian telescope, in which starlight is reflected to the front of the telescope by a tilted concave primary mirror and is viewed through an eyepiece at the edge of the tube.

Further reading

These are just a few of the many books, magazine articles, and encyclopedia references that could be cited on the telescope. Listed are works at hand during the preparation of the present article:

The Telescope. Louis Bell. McGraw-Hill Book Company, Inc., New York. 1922.

Telescopes and Accessories. George Z. Dimitroff and James G. Baker. The Blakiston Co., Philadelphia. 1945.

The History of the Telescope. Henry C. King. Sky Publishing Corporation, Cambridge. 1955.

Amateur Telescope Making. Russel W. Porter. Scientific American Publishing Co., New York. 1926.

The Glass Giant of Palomar. David A. Woodbury. Dodd, Mead and Company, New York. 1948.

"The Eye that Will Look for the Uttermost." Leland S. Copeland. *The Sky and Telescope*, February 1946.

"Discovery in Space." Earle G. Linsley. *Pacific Discovery*, May-June 1948.

"A Heritage of Fine Instruments." George W. Bunton. *Pacific Discovery*, January-February 1958.

SKY DIARY

May, June, July 1960

(Pacific Daylight Saving Time Used Throughout)

Phases of the Moon

First Quarter	May 3	6.01 P.M.
Full Moon	11	10:43 P.M.
Last Quarter	17	12:55 P.M.
New Moon	25	5:27 A.M.
First Quarter	June 2	9:02 A.M.
Full Moon	9	6:02 A.M.
Last Quarter	15	9:36 P.M.
New Moon	23	8:27 P.M.
First Quarter	July 1	8:49 P.M.
Full Moon	8	12:37 P.M.
Last Quarter	15	8:43 A.M.
New Moon	23	11:31 A.M.
First Quarter	31	5:39 A.M.

The Planets

Mercury: Is at greatest eastern elongation on June 19 and is close to Pollux. For a few evenings at that time it may be seen low in the west after sunset. During July Mercury is too close to the Sun for observation, being at inferior conjunction on the 16th.

Venus: Is too close to the Sun during these months for observation. It will be at superior conjunction on June 22 and will begin to appear as an evening star toward the end of July.

Mars: Moves from Pisces in May to Aries in June. In July the planet moves to Taurus and will be prominent in the eastern sky for about three hours before sunrise.

Jupiter: Is in retrograde motion in Saggitarius and rising about sunset. It dominates the southern sky all night. Its magnitude will vary from −2.1 to −2.2 during the period. Jupiter will be at opposition on June 19.

Saturn: Is in retrograde motion in Saggitarius and rising about one hour after sunset. The planet sets just before sunrise. It will be at opposition on July 7.

Special Event: The Sun enters Cancer and summer will begin at 2:43 A.M. on June 21. M.R.A.

History across the Pacific

East Wind Rising: *A Long View of the Pacific Crisis.* By Relman Morin. Alfred A. Knopf, New York. 1960. 359 + v (Index) pp., map. $5.00.

"One of our most distinguished foreign correspondents and a two-time Pulitzer Prize winner views the Pacific tragedy in the perspective of thirty years' experience in the Far East"—this may signify to the jacket-flap browser something more than just another news jockey's rehash of events and I-saw-it-happenings. I hope it will, because I got from this crisply-styled, often humorous, always exciting journal of an era in the Pacific concurrent with all my own adult life to the present, several things of value. There were true-adventure incidents of high spine-tingling voltage; deft and full-color pictures of personalities and places (Morin's description of Peking—"the glory of the ages"—ranks, for me, among the classics of its sort); and the fateful march of history from revolution in China to revolt on the 38th Parallel. There was a terse but incisive analytical outline of the stages by which China became Communist, in which some long-held suppositions of many of us are effectively challenged. There was some high-pitched inside-Japan stuff, prelude to Pearl Harbor, in which the author in due course found himself jugged as a spy-suspect—all this tensely connected with the immediate background to Japan's warmaking in Asia and the Pacific. And this brings us to what some may want to call the "message" of this book though I am sure the author only wants us to listen attentively to the lesser tickings of history which we so often do not, or will not, hear. He remembers California truck-gardens and strawberry fields, in the twenties, and the stooping figures, and light-hued boys wheeling down the road past, to fling a few rocks and a few jibes, sometimes featuring the word "Jap!" . . . He remembered well, in a Japanese military prison compound, in the forties. He was one of those boys on a bike.

Morin does not condone aggression, nor excuse treachery. But he has this to say, in conclusion: both peoples have "violated Human Dignity. When recognition of human dignity is withheld from a man because of his race or nationality or religion, when he is scorned and persecuted, when his weakness is exploited, then the law of retribution is as sure as fate.

"This law is operating today in China. The Chinese are having their revenge on history. Revenge for the years of misery. Revenge for the lost fruits of the Chinese Revolution. Revenge for the Opium War, the Japanese atrocities, for every ricksha coolie a white man slapped. They will have it in full measure. Then, but not before, we will restore friendship with China as we have with Japan." The ticking is loud enough for us all to hear. Are we listening with unplugged ears?

Cameleopards and crossops

Out of Noah's Ark: *The Story of Man's Discovery of the Animal Kingdom.* By Herbert Wendt. Translated from the German by Michael Bullock. Houghton Mifflin Company, Boston. 1959. xiv + 464 pp., profusely illustrated in halftone and line. $6.50.

From the Ice Age men who drew and painted on cave walls in Southern France, Spain, Italy, and Africa, accurately and knowingly, the animals they hunted or feared—mammoths, bison, horses and deer, lions and bears—to the scientists who in our own generation have discovered and eagerly studied the "living fossil" crossopterygian fish, *Latimeria,* so recently found in the Indian Ocean, there runs a long and exciting trail. This is the road we have traveled, as *man,* in our historic relationship to the earth's other animals. Along it we have run the course from our common wildness with them, predation, domestication, fear, worship, discovery, to all-out exploitation, frequent total extermination, and exhaustive scientific study.

Perhaps nothing in the world has afforded man more continuous interest, wonder, excitement, pleasure, and challenge to learning and understanding, than these our traveling companions. *Out of Noah's Ark* is the fascinating story of discovery and progress from mystery and superstition to knowledge and appreciation of animal kinds, which Herbert Wendt has skilfully and scientifically written for the everyday reader. Here are dragons and unicorns and what they were compounded—or confounded—of; the wonderful array of zoölogical fables and riddles; the naturalists and explorers of the animal world; the travelers and seafarers who brought strange things and stranger tales from new-found lands and seas; the pathfinders of paleontology and evolution; the patient builders of modern scientific knowledge. The illustrations are an

Follow-up

The Scripps Institution of Oceanography, University of California, La Jolla, in a news release dated 10 March, 1960, gives a perfect "follow-up" to the article "Tsunami: Destructive Oceanic Waves" by Francis P. Filice (PD, September-October 1959), and thus kicks off a new column, which will appear as regularly as available material permits. The item in its entirety:

AN IMPROVED METHOD of forecasting destructive sea waves set in motion by underwater earthquakes and volcanic eruptions has been devised by William G. Van Dorn, engineer at The University of California's Scripps Institution of Oceanography.

The method depends on the study of records produced on special long-period wave recorders installed on the tiny islands of Wake, Johnston, and Canton in the Pacific. As the destructive waves, called tsunami, pass these isles, their length, which may be several miles, and height, which rarely reaches more than one foot, are recorded. The recording instruments are especially designed to be sensitive to these waves and no others.

When such waves reach larger islands which slope up gently from the sea floor, such as Oahu, they can increase twenty to thirty times in height. In the past, notably in April, 1946, they have resulted in death and severe property damage.

The present Pacific-wide warning system tells only the time, place, and intensity of the seismic activity which causes the waves, Van Dorn says, allowing the islands to be alerted to the risk of high waves, but not providing specific forecasts of wave height. Since the actual height depends on a variety of factors, among them the depth of the quake beneath the earth's surface, a severe earthquake may in one instance produce waves twenty feet high and in another no extraordinary waves at all. Further study may permit actual heights to be forecast from seismic data alone, Van Dorn says, but this is impossible at present.

By using theoretical studies and field investigations, Van Dorn has worked out a method whereby the open-ocean wave height, as observed at the smaller islands, can be extrapolated to actual heights onshore at larger islands and on the shores of the Pacific.

His work has received support from the Office of Naval Research.

FROM THE READER

"To Keep This Forest Primeval"

DR. ARTHUR C. SMITH, *Pacific Discovery:*

. . . Thank you and Mr. Kelley for the wonderful "To Keep This Forest Primeval" as well as your most generous mention in Focus on Nature. Both are so good that I cannot express any adequate praise. This is all just as I knew it would be when we learned you would do it. The whole job is superb. I have not the least doubt it will do a great amount of good for this project. . . .

Since you were here . . . there has really been a rough time. We found out the reason the big redwood went down across the Skunk Creek bridge was because the young fir, with roots under the redwood, apparently went first and pried over, like a gigantic crowbar, the redwood. About a week later a sort of unusual twister brought down several more trees across the road, one of them across the north approach to the Elder Creek bridge. By now it is cleared away enough so the Rover can get by easily, and other vehicles this far with difficulty. There is a lot more which must be done soon. We were marooned for about five weeks, due to the delays in getting at it, and had to back-pack in mail and supplies. . . . HEATH ANGELO

Branscomb P.O., Calif., 15 March 1960.

NATURE EDITOR, *Pacific Discovery:*

Just a word of very deep appreciation of your "To Keep This Forest Primeval" in the current [March-April 1960] number. Not only is the text most convincing, the photographs are most helpful.

It must be nearly a half-century now since we-2 recognized the worth of what our friend the late Dr. [Willis Linn] Jepson called "Lowland Fir Forest." At that time we tried to jolt into action a movement to preserve the territory. We had invested a fortnight in field work there under decidedly primitive conditions. Dr. Jepson told us it was the best stand in existence of Lowland Fir. . . . C. M. GOETHE

Sacramento, Calif., 19 March 1960.

Mr. Goethe's and Dr. Jepson's "Lowland Fir" (Abies grandis) *should not be confused with Douglas fir* (Pseudotsuga douglasi), *which is the dominant tree of Arthur C. Smith's "Forest Primeval."* —ED.

EDITOR, *Pacific Discovery:*

I read with great interest the story by Arthur C. Smith in the March-April *PD*—"To Keep This Forest Primeval." It is admirable to champion the preservation of representative plots of primeval forest in the West but I should like to point out that we are blessed with a goodly parcel of such plots in the state and federal parks of the Redwood Region—more than 70,000 acres, in fact—and the proposed Point Reyes National Park will add another 53,000 acres.

I'm not in a position to comment on the comparative values, from the standpoint of ecology and forestry, of the proposed Northern California Coast Range Preserve along the Elder Creek and Eel River drainages in Mendocino County with existing parks and preserves—that I should prefer to have done by our forester.

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absorbing array of prints and drawings out of the young centuries when unfettered imagination supplied details of anatomy and habit unknown through observation, of the meticulous renderings (here in halftone) from the wondrous time of great explorer-naturalists and new continents, of photographs of such survivals and anomalies as Père David's deer and Przewalski's horse and of fossil slabs from the quarryings of bygone epochs. It all adds up to a rich and rewarding book.

The living desert

The Natural History of the Southwest. Edited by William A. Burns. Contributing Editors: William H. Woodin, Merwin W. Larson, Lewis Wayne Walker, Peggy Pickering Larson. Franklin Watts, Inc., New York. 1960. 145 pp., profusely illustrated with photographs in full color and halftone. $4.95.

Published the same day as this issue of *PD*, this handsome volume with pictures on every 9x12-inch page is the product of collaboration between The American Museum of Natural History (William A. Burns is Editor, Man and Nature Publications) and the Arizona-Sonora Desert Museum. The Editor writes "The Story of the Southwest"—physical features, history, Indians; Peggy Pickering Larson, Arizona-Sonora Staff Associate, deals with "The Trees, Flowers, and Shrubs"; the Tucson museum's Director, William H. Woodin gives an account of "The Reptiles"; its Associate Curator and well known photographer Lewis Wayne Walker writes on "The Birds" and "The Mammals." (The role of Merwin W. Larson, Curator of Exhibits, is not elucidated.) The splendid black-and-white photographs are very well reproduced in the offset process along with the text. The equally fine color photos come off, unfortunately, less well. Many are nicely registered and fairly true in color; several—in the copy at hand—are either out-of-register or way off color, or both. Since the book is so well conceived and solidly founded on authoritative knowledge of the subject matter, it should stand long on the active list; therefore it is to be hoped that future printings may be greatly improved in the color department.

Vacation vade mecums

McKay's Guide to Alaska. By Robert G. Hart. David McKay Company, Inc., New York. 1959. x + 329 pp., endpaper and 3 text maps. $5.00.

Most recent in a well known series of popular guides to parts of the world tourists frequent, this is described as "the first comprehensive travel guide to Alaska today" and its author as a resident who "knows the state firsthand." One who does not know the state firsthand probably has no business to comment; but the impression a sampling of the book makes is very good, and conduces to a desire to go and give it the old field tryout. It is certainly jampacked with information for both tourists and prospective settlers —the wheres, how fars, how muches, local customs and expressions, historical background, and the rest. There are no pictures—but then the author has good advice: go to Alaska with camera in hand and take your own, the forty-ninth state is very photogenic.

Crystal & Mineral Collecting. By William B. Sanborn. (A Sunset Book.) Lane Book Company, Menlo Park California. 1960. 144 pp., 90 halftone figs. $3.50.

One of the choicest private collections of minerals in California, if not in the U.S., belongs to a young man whose interests include Indians, the national parks and monuments, and photography. He is a *PD* author ("Groves of Stone: Fossil Forests of the Yellowstone Region," May-June 1951); and for several years now has been Director of Audio-Visual Education for the San Francisco Unified School District. He is Dr. William B. Sanborn. *Crystal & Mineral Collecting* stems from his own lifelong fascination with the subject which he has pursued with scientific know-how as well as with the true amateur's enthusiasm. Taking its place in the distinctive line of Sunset "how-to" books—though in small-page and hard-cover format to fit the field kit—this teaches mineralogy as it guides the new collector to finding his specimens, identifying them (techniques—this is not a guide to specific identifications), and curating them in a properly organized collection. It fills a long-felt need in the West. D.G.K.

I do know, however, that this constant "hacking away" at privately owned and operated, tax-paying timber of the Redwood Region is having its affect on the economies of the North Coast Counties.

BERNARR BATES
Director of Press Relations
California Redwood Association

San Francisco, 12 April 1960.

"A Forest Dies on Mauna Kea"

EDITOR, *Pacific Discovery:*

My compliments and congratulations on your excellent March-April *PD* in which you have presented so forcefully pleas for the conservation of our dwindling natural resources. As one long familiar with the tragic despoliation of Hawaii, I wish to commend you especially for the publication of Richard E. Warner's excellent article "A Forest Dies on Mauna Kea." As Mr. Warner has demonstrated so ably, the devastation of the unique forests of Hawaii is a blot on the Hawaiian record. What is even worse is that it is allowed to continue, and some pressure groups are trying to compound the damage. The majority of the highly unusual endemic land birds of Hawaii have been exterminated, many unique plants are now extinct and others are rapidly nearing extinction, and the wonderful land snail and insect faunas have been decimated.

It is the publication of articles such as these you have issued that go far in carrying the conservation message to a public that is gradually awakening to the grave situation. The demand for protected remnants of forest and wildlife sanctuaries by future generations will be greater even than ours, and forceful action must be taken by this generation to preserve some remaining parts of our heritage of the wild. I look forward to seeing more articles on conservation in your magazine. You are doing an excellent job.

ELWOOD C. ZIMMERMAN

Peterborough, N.H., 14 April 1960.

EDITOR, *Pacific Discovery:*

It was with mingled thoughts that I read "A Forest Dies on Mauna Kea" by Richard E. Warner [*PD,* March-April 1960]. It was indeed distressing to learn that even that remote, isolated spot has not escaped the ravages of uncontrolled livestock grazing. But there is encouragement in the fact that the ruin there, however distant it may be from our own devastated ranges, has been accurately studied and reported. It is even more encouraging to note that the writer and observer of these appalling conditions is now teaching at the University of California.

Perhaps we may hope that this enlightenment and alarm about range ruin on the mountain-top of a small, distant island may be brought to bear on conditions fully as bad, that prevail and spread on an ever increasing scale, right here at home, and right under our noses.

IAN I. MCMILLAN

Shandon, Calif., 20 March 1960.

"Landscaping vs. Landscraping"

EDITOR, *Pacific Discovery:*

The article, "Landscaping vs. Landscraping" by Ben Ehrich, . . . was indeed most interesting. I sincerely hope that many shall read this stimulating essay.

ALBERT SHUMATE, M.D.

San Francisco, 12 April 1960.

On discovering PD

CALIFORNIA ACADEMY OF SCIENCES:

We received your notice of our having been given a gift Family Membership in the Academy, and are very happy to join in supporting your excellent work.

We have been subscribing to *Pacific Discovery* for over a year now, and . . . as long as the occasion to write a letter to you has arisen, we must take this opportunity to commend you upon your excellent publication. I have never seen a similar magazine which gave such a favorable impression. We count it among those rare publications in which everything is interesting and worth reading.

ALICE (MRS. JOHN C.) HOWARD

Lafayette, Calif., 16 March 1960.

EDITOR, *Pacific Discovery:*

As a frequent "fly-in" visitor to The Nut Tree at Vacaville, [California, whose owner-in-partnership is Robert H. Power, author of the article "Portus Novae Albionis Rediscovered?" in *PD,* May-June 1954—ED.], I always browse through their well stocked magazine rack. This trip I discovered *Pacific Discovery* for the first time and greatly enjoyed reading it, particularly the articles on the Galápagos Islands and Charles Darwin. The book reviews offer excellent reading suggestions, some of which are familiar, but many that I look forward to with much anticipation. . . . I am enclosing a check for a subscription. . . . I really hate to miss one now that I've discovered it.

MRS. FRANKLIN D. CLOSE

Castro Valley, Calif., 19 March 1960.

CALIFORNIA ACADEMY OF SCIENCES:

Please enter my subscription to *Pacific Discovery.* . . . I have been wanting to become a subscriber to your excellent magazine since making its acquaintance a few months ago, and am very enthusiastic over the many good things to be found in (it).

I grew up in San Francisco but have been in Southern California for almost 20 years. On a recent trip north (last autumn) I made a visit to your Golden Gate Park buildings and was particularly impressed with the fascinating mineralogy display. It is an excellent exhibit and beautifully displayed. . . .

Many thanks, also, for the many delightful moments spent with *Pacific Discovery*—each issue increases my enthusiasm.

MRS. J. HERBERT KNECHT

Whittier, 7 April 1960.

EDITOR, *Pacific Discovery:*

It seems that each issue of *PD* is better than the last. This March-April tops all. From cover design, on in and through to the end, each time a page is turned it is a delightful experience in well designed format.

I just finished going through it with our girls and I thought I had better let you know how much we appreciate . . . this the most outstanding magazine we know of.

HAROLD GREGG
Co-Director, Forest Farm Enterprises

Forest Knolls, Calif., 16 March 1960.

academically speaking

IT WAS THE GENERAL CONSENSUS that this year's Bay Area Science Fair held at the Academy from April 2 to 6 was the most exceptional and the most successful of any of the seven so far. The officials concerned, the distinguished panel of judges, and the record-breaking crowd of visitors who journeyed to Golden Gate Park to see the work of numbers of tyro scientists agreed that the quality of the exhibits as well as their presentation exceeded all previous efforts, and that a new high had been reached in a community project which has had the ever-increasing support of teachers, school authorities, science societies, and men of business and industry.

From a total of approximately 6,000 projects which were prepared by students in the high schools of 12 Bay Area counties, 350 were adjudged to be of such caliber as to vie for honors in the penultimate fair held at the Academy, the ultimate being the national science fair which convenes at Indianapolis from May 11 to 14, where the senior division winners in both biological and physical sciences competed for national honors.

The judges had no easy task. But, after considerable cogitation, contemplation, and discussion, they agreed upon the four top winners, senior and junior divisions. Mark the impressive titles of the projects created by the champions:

"Precession Magnetometry," grand prize, physical sciences, senior division, by Donald Shapero, 17, Cubberley Senior High School, Palo Alto.

"Reproduction in *Chlorella pyrenoidosa*," grand prize, biological sciences, senior division, by Margaret Martin, 17, El Cerrito High School.

"Polarization Effect of Reflected Light from Metals," grand prize, physical sciences, junior division, by Claude Anderson, 15, San Mateo High School.

"Skin Resistance: It May Save Your Life," grand prize, biological sciences, junior division, by Randy Olson, 12, Portola Junior High School, El Cerrito.

Calamity howlers who view the younger generation as a herd of disinterested, undisciplined, ne'er-do-well delinquents would have done themselves a favor by attending the awards presentation ceremony on Friday evening, April 1. Or, if unavailable for that, they should have come to the Academy on Saturday or Sunday of the Fair days and joined forces with the approximately 20,000 parents, children, teachers, and other visitors who filled the Halls of Science each of those days to examine, with much more than cursory interest, the projects which these teen and sub-teenagers presented. These cynics would have been either of two things: impressed or intimidated.

. . . . .

This column, being devoted as it is this month to young people under 18, offers a wonderful opportunity to share a letter which was addressed to the Academy's Director, Dr. Robert C. Miller. Its eloquence demands your attention.

"Dear Dr. Miller:

I feel that I must once again express my gratitude for the invaluable training our son, Robin, had in the Student Section of the Academy of Sciences during the years 1951 through 1957.

During this time his chosen field was marine biology. As a result of that training, he chose zoology as his major in college, a subject in which he has been able to make easy A's. He now attends the University of California at Davis.

The other day in Zoology class, the final examination consisted of 6 dissected animals displayed for identification by the class. Robin says he walked in, took one look, identified the animals and classified them, and walked out again. Robin received another A—all, he says, because he had studied those same animals in the Academy.

Another examination consisted of a single dissected animal with which the class was totally unfamiliar. This animal was to be identified as to class, if not as to species. Robin was one of the only two in his class to be correct in his identification. Again he said this was due to the Academy.

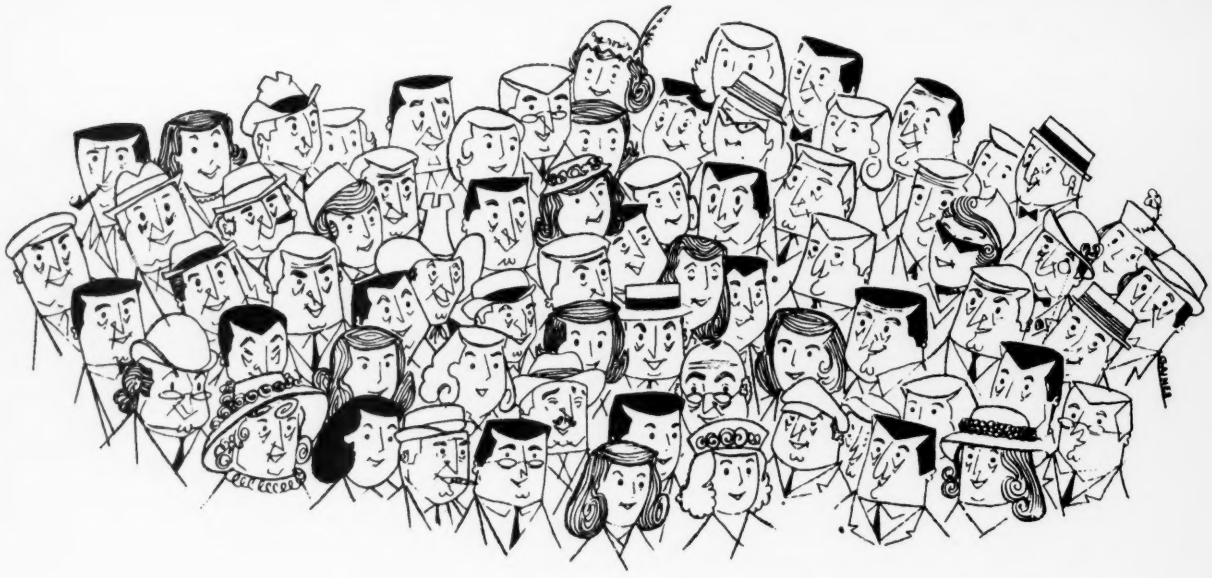
I thought you might like to know of this, and that perhaps it might help to inspire some of your other young students to apply themselves and to appreciate what is offered them there. They might discover later on that what they learned, can be of inestimable value. . . .

Gratefully,
/s/ ANNA (MRS. ERNEST) LENN"

The student Section of the California Academy of Sciences is now in a position to welcome new members to its facilities, its meetings, its supervised training, its field trips, its collections and the many other advantages and activities for which Mrs. Lenn has such grateful admiration. If there is a science-minded young person within your purview who would benefit from the direction or the inspiration which the Academy's Student Section can give, a telephone call to BAYVIEW 1-5100 may be a most salubrious "Open Sesame!" H. R.

Award winners of the 1960 Bay Area Science Fair on the platform in the Academy's May T. Morrison Auditorium; and a view of a small part of the Fair in African Hall. (CAS photos: Haas & Associates)

ABOUT 821,003 PEOPLE LIVE IN SAN FRANCISCO . . . BUT



2,405,270* PERSONS VISITED THE

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"It is good to know that the West's oldest scientific institution has more vigor than ever." *San Francisco Examiner*

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* Figure based on a national survey.